AN ENVIRONMENTAL PROFILE OF THE BADULLA DISTRICT

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ENTRAL ENVIRONMENTAL AUTHORITY
NISTRY OF ENVIRONMENT & PARLIAMENTARY AFFAIRS

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A Report written by Prof. M. M. Karunanayake of a study sponsored by the Central Environmental Authority with NORAD collaboration

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FOREWORD

Sri Lanka's national energies and efforts during the last few decades have increasingly been towards the achievement of economic and social goals of development. However, unplanned development, without due regard to the protection and management of the environment, could lead to the reduction of the country's natural resources base and the degradation of the environment. The fruitful incorporation and integration of environmental considerations into the development strategies are fundamental to sustainable development. Unfortunately environmental concerns have not been incorporated into the planning process of some development projects and programmes. This has been mainly due to the lack of information on available human and natural resources, their utilization and development.

The Central Environmental Authority launched a programme to prepare District Environmental Profiles for each of the districts within the Island to identify and review the human and natural resources, their utilization, and significant environmental problems, associated with each district. I am grateful to the Norwegian Embassy for Development Co-operation (NORAD) for providing the necessary financial assistance to carry out this project.

The profiles have been prepared for the CEA by various competent and authoritative personnel and their ready cooperation in the successful completion of this exercise is duly acknowledged. The project has been managed by the Natural Resources Management Division of the CEA.

I trust that this Environmental Profile would serve as a tool in the future development planning process for effective protection and management of the environment.

G. K. Amaratunga
Chairman
Central Environmental Authority

December 1992.

CONTENTS

	Page
Preface	VII
List of Figures	IX
List of Tables	X
Chapter 1 – Introduction	01
Chapter 2 – The Physical and Human Setting	05
Chapter 3 – Environmental Problems	19
Chapter 4 – Existing Methods of Environmental Management	27
Chapter 5 – Implications for Environmental Planning	37

PREFACE

This study sponsored by the Central Environmental Authority in collaboration with NORAD provides an environmental profile for the Badulla District with a view to develop an action plan for the management of its environment. Within the spatial framework of the Badulla District it identifies the more significant environmental problems and examines the existing machinery for their resolution. It stresses the importance of promoting participatory processes in managing the environment and suggests guidelines for the development of an action plan for effective environmental management.

I am grateful to the Central Environmental Authority and its Director General Mr. W. D. Ailapperuma for commissioning this study.

In executing the study the Government Agent, Badulla District, Mr. D. M. P. B. Dassanayake and the Additional Government Agent Mr. D. Tantirige were helpful in obtaining preliminary information from the fourteen AGA divisions of the district. The responsiveness of the AGAs and many other divisional and frontline officials of several line departments - notably those of Agriculture, Forest and Health, to a study of this nature, contributed much to the success of the field programme. I shall be failing in my duty if I do not acknowledge the very enthusiastic response received from the late Mr. P. B. Pihillegedera to this study, in his capacity as the Government Agent Badulla District, when the idea was first mooted.

Mr. M. D. C. Abhayaratne was associated in planning-out the study and in drawing-up the questionnaire which tested the people's attitudes to existing methods of environmental management. The field-work on which the substantive sections of this report is based was undertaken by a team of investigators comprising Messrs K. Amarakone, S. Batuwangala, W. J. M. Dayaratne and N. Jayawardena. Dr. C. K. M. Deheragoda and Messrs L. K. Perera and G. M. Bandaranayake undertook the attitudinal evaluation of the people to existing methods of environmental management. Dr. (Mrs.) Y. A. D. S. Wanasinghe compiled the second chapter which provides a comprehensive background to the Badulla District. I express my sincere thanks to all of them.

The maps and diagrams have been prepared by Mr. L. K. Perera.

It is fervently hoped that this report will provide the basis for and assist in the development of an environmental action plan for the Badulla District to enhance and sustain the quality of life of its people.

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List of Figures

	Page
1. Orientation	03
2. Relief	06
3. Cross-Profiles of Selected Areas	07
4. Drainage System	08
5. Agro-Ecological Zones	11
6. Transport Linkages	17
7. Environmental Problems	20
8. Interrelationship Between Development Planning and DEMP	40

List of Tables

		Page
2.1	Mean Seasonal Distribution of Rainfall	09
2.2	Variation (coefficient variation) of Monthly Rainfall %	09
2.3	Land-Use	10
2.4	Size of Tea Small Holdings	12
2.5	Ownership of Holdings	13
2.6	Percentage Analysis of Industries by Type	14
2.7	Growth Rates of Urban Centres	15
2.8	Employed Population by Occupation	15
2.9	Housing Schemes in the District	16
2.10	Health Personnel Per 10,000 Population	18
3.1	Occupied Housing Units by Type and Toilet Facilities	23
3.2	Occupied Housing Units by Type and Main Source of Drinking Water	24
4.1	Reasons for Failure to Take Prompt Action by Officials	32
4.2	Propensity to Report to Officials	32

CHAPTER 1

INTRODUCTION

This report titled the *"Badulla District : An Environmental Profile"* has been sponsored by the Central Environmental Authority with collaboration by NORAD. The project has not been conceived as an academic exercise, but as one with practical implications, which provides the basis for the development of an environmental action plan for the Badulla District. In this study, the idea is both implicit and explicit that environmental planning and management should essentially have a regional focus. In this regard it may be mentioned that similar studies have been proposed for four other districts including Hambantota and Matale.[1] It is especially significant that the present study has been completed at a time when the CEA is in the process of evolving a *"National Conservation Strategy"*. Undoubtedly it is through properly conceived environmental action plans, drawn-up on a regional basis, that the ideals inherent in a national conservation strategy could be translated into the realm of positive action.

Conceptualization

A concern for environmental management is opportune for several reasons. In pushing economic development to deal with the pervasive problems of poverty, unemployment and social inequities (for example in income distribution)[2] environmental issues have not been looked at with any sense of urgency. Where there has been such concern it has been very much as an afterthought. Hence the very crucial relationship between economic development and environmental management has, quite often, been ignored.[3] A second pertinent point is that in the longer-term, Sri Lanka (as indeed most developing countries) must rely on renewable resources which involves a,

> 'Long-term process of avoiding non-reversible degradation of renewable systems, of investing wisely, and learning to manage the systems more productively.'[4]

Although at first glance environmental management appears to be concerned with the problem of resource management per se, an extended view of environmental management brings-out that the problems have much to do with the users themselves. The competition for resources among different users generate disparate forces and pressures which have a direct bearing on the sustainable use of the environment and its resources. Hence community participatory processes need to be built in, any effective strategy for environmental management. Community participation would not only 'socialize' the decision-making process but also facilitate the acceptance of final decisions by the communities concerned.[5]

A further point is that, environmental management is concerned with the rational adjustment between the competing objectives of resource use and conservation. But because the bio-physical and the socio-political

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1. There is, of course, the basic problem that the administrative district is not a coherent unit for the purpose of environmental planning. But given the reality of administrative boundaries, there is no immediate feasible option but to plan environmental management within its confines.
2. M. M. Karunanayake, 'The Poor Revisited: Reflections on the Rural Development Experience in Sri Lanka' *Proceedings of the SLAAS, Part II,* (1986) 42 pp, 95 — 106.
3. Even though Environmental Impact Assessment has been mandatory for all development projects of both the public and private sector, it has been subject to various constraints at the level of implementation. However, as reported in Environmental News 1987, Vol. III Nos 11 and 12, EIA of development projects will receive statuory sanction with the proposed amendments to the National Environment Act, No. 47 of 1980. The Government has also approved the proposal that all development proposals with environmental implications be examined by the CEA before submission to the Cabinet of Ministers for approval.
4. C. W. Howe (ed) *Managing Renewable Natural Resources in Developing Countries,* 1982, Westview Press, Colorado, p1.
5. See for example, Jose G. Tundisi, 'Local Community in Environmental Planning and Management: The Lobo-Broa Reservoir Case Study' *Regional Development Dialogue* (1987) Vol. 8, No. 3, pp. 133–156.

environments exist in a state of constant flux it is imperative that such adjustments be continuous and interactive. Therefore, a capacity for resilience is of the essence in environmental management.

It is of some relevance to note that *"Environmental Management"* is not a totally new concept. Throughout the world, there have been traditional methods of environmental management geared to the rationalizing of resource use.[6] The case of Sri Lanka is no exception. Among the Dry Zone peasantry, for example, very finely articulated systems of irrigation water-use made interactive adjustments possible between 'water-use' and 'water-availability.'[7] In this regard the *bethma* institution is a case par-excellence. However, in the face of increasing pressure of population, externalizing of economic systems, and technological advance such traditional systems have not been sustained, thus accelerating the process of environmental degradation. Therefore, it would be relevant for environmental planners to look at possibilities, where relevant to revive,

> 'such lapsed attitudes and practices as they previously
> existed or in some new slightly modified form'[8]

This could indeed be a useful point of entry to promote community participatory processes in environmental management.

Objectives

The present study has been designed to highlight and articulate those issues which necessarily need consideration in the development of an action plan for environmental management for the Badulla District (Fig.1). Hence, the study focuses on two broad areas viz.,

- identification of basic environmental problems
- appraising the existing methods of environmental management. In this special emphasis is placed on the problems and limitations of existing implementation machinery. Furthermore, the perceived attitudes of the community to existing methods of environmental management and the extent to which participatory processes are built-in the management process are also given due consideration.

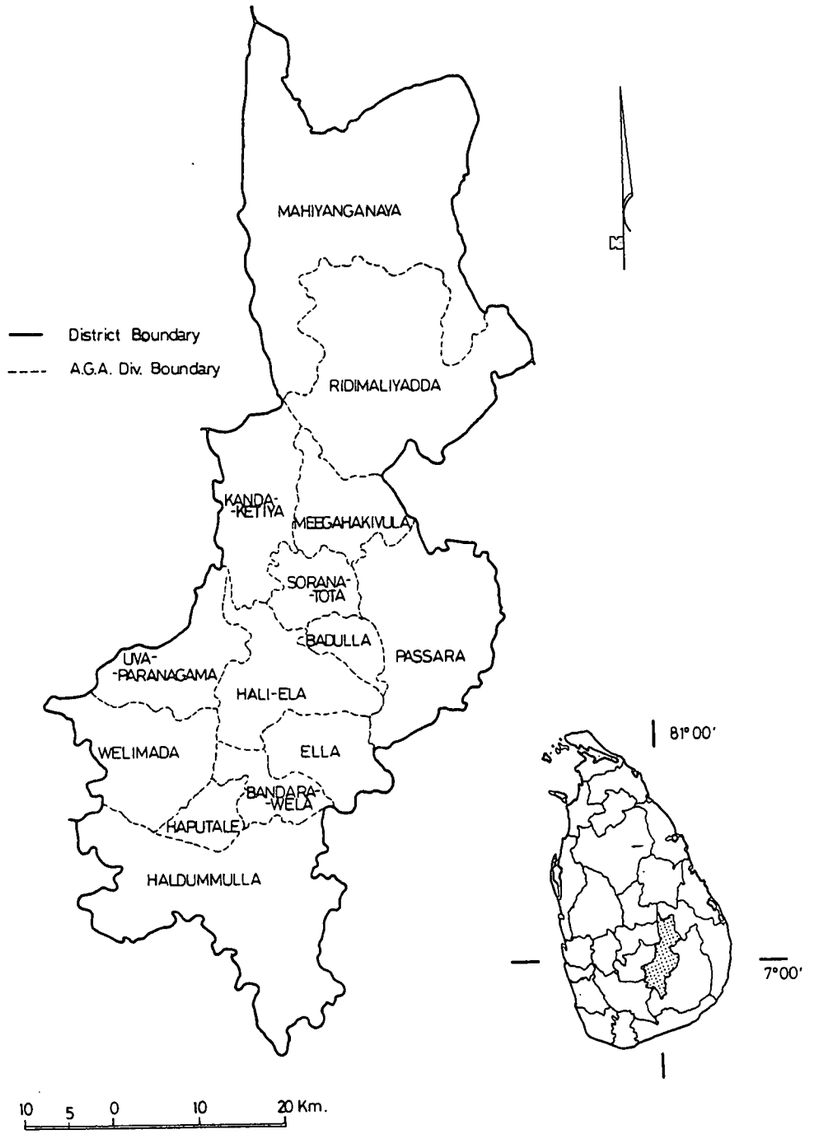
Based on the findings, the study outlines the guidelines for an action plan. However, it needs to be stressed that the imperatives of an action plan for the district cannot be discussed in the abstract without reference to the national scenario. Therefore, in the final analysis it has to take cognizance of the broader issues impinging on environmental management such as existing legislation, institutions, and the administrative machinery. Hence, some of the desirable reforms that need to be introduced by the Centre for effective environmental management at the District level have been commented upon, in the proposed guidelines for the action plan.

Methodology

Although secondary sources have been consulted, this study is primarily based on field-investigations carried out in spells between March 1987 and January 1988. Initially, opinion was canvassed through a brief questionnaire from all Assistant Government Agents in-charge of divisions in the Badulla District, on the nature of environmental problems in their particular divisions. On the basis of this information, the relevant issues and locations for reconnaissance work were identified. This phase of the survey was undertaken in selected areas of all the AGA divisions, using rapid appraisal techniques which included the use of maps, observation and informal discussions with officials and key informents from the localities in question. Based on reconnaissance work, field-investigations of a more in-depth nature were undertaken which in addition to the above techniques, utilized structured interviews to gather information from officials and communities. The final stage of the field-work related to an attitudinal study of communities (forty-five respondents from Dunhida in Soranatota AGA division, Waliwatta in Passara AGA division and Katugolla in Welimada AGA division were interviewed) by administering a questionnaire designed for the purpose. The team of investigators was given a short training prior to commencement of field-work; and its work in the field was closely monitored.

6 Gary A. Klee (ed) *World Systems of Traditional Resource Management* (1980) Edwin Arnold, p. 3.
7 M. M. Karunanayake, 'The Adaptation to Droughts in a Dry Zone Village of Sri Lanka' in R. L. Singh (ed) *Geographic Dimensions of Rural Settlements* (1976) B. H. U. India, pp. 41–49.
8 Gary A. Klee op. cit.

Fig. 1 Orientation - Badulla District



Limitations

The very limited availability of secondary data, in published form, relating to the Badulla District was a major constraint. Similarly an exhaustive analysis of official records was ruled out for practical considerations. As the district covers a wide area, in-depth study of environmental issues had to be necessarily restricted to selected areas. Although the government officials were on the whole helpful and co-operative, there was reluctance on their part to divulge or comment on information of a sensitive nature. In the latter phase of the study field investigations had to be undertaken with circumspection in view of the generally unsettled conditions in the country, including parts of the Badulla District.

CHAPTER 2

THE PHYSICAL AND HUMAN SETTING

This chapter which provides a comprehensive account of the Badulla District on the basis of available secondary data is intended as a backdrop to chapters three and four.

Topography

The Badulla District is located to the East of the Central highlands. Physiographically, it is a complex region with mountain ranges, dissected plateaus, escarpments and narrow valleys covering a greater proportion of the district (Fig. 2). The Eastern arm of the Central highlands extends towards Dewatagala in the East, through the Southern part of the district. This Eastern range has an elevation ranging from 1200–1800 metres (Fig. 3, cross profile C–D). To the East is the North-South aligned Namunukulá range beyond which are located a section of Lunugala ridges that rise to over 1200 metres. The terrain of these ridges is rugged. At the extreme South of the district seperated from the Eastern range by a steep escarpment is a section of the Koslanda plateau (Fig. 3, cross profile A–B), with an elevation ranging from 300–1000 metres.

Encircled on three sides by the Central highlands, the Eastern and Namunakula ranges and Lunugala ridges, is the distinctive and clearly demarcated Uva Basin (elevation below 1200 metres). The rim of the Basin and the Uva highlands located in its centre are highly dissected by the Northward flowing Uma, Badulu, Loggal Oyas and their tributaries (Fig. 4). Their valley bottoms have undulating floors while the flanking hills rise sometimes to a height of 900 metres. The Badulu Oya, for example, flows in a deep valley and its lateral tributaries too have carved up deep valleys on either side. To the West of the Basin rises the Welimada plateau whose general elevation varies between 1000–1200 metres. In this region land slopes from West to East; with slopes ranging in gradient from 8–25 percent.

On the whole the general gradient of a large part of the district is Northwards to the valley of the Mahaweli ganga (Fig. 3, cross profile E–F).

Several headstreams of the Mahaweli ganga, Walawe ganga, Kirindi, Kumbukkan and Gal Oya rise in the mountain ranges within the district and flow North, South and Eastwards across the district (Fig. 4).

Climate

The average annual rainfall in the district is around 2000 mm but it varies from 900 mm in the Northern and Southern most extremieties of the district to over 2500 mm in the Eastern flanks of the Central highlands, Namunukula and Lunugala ridges. The average annual rainfall of the Uva Basin which is protected on all sides by highlands is approximately 1700 mm.

The Northeast Monsoon provides a comparatively high rainfall to the Eastern slopes of the Lunugala and Namunukula ridges between December and February; the Uva Basin however lies in the rainshadow during this season. During the first intermonsoon season (March to mid May) the whole district receives about 300–500 mm of rainfall. The district lies in the lee of the Central mountain range during the Southwest monsoon season which extends from mid May to September. The total rainfall received during these5 months therefore ranges between 500–700 mm whereas during the 2 months of the second inter-monsoon season the district receives as much as 500–750 mm.

The rainfall regimes differ from station to station. In the Northern most tip of the Lunugala ridges 40–50 percent of the annual rainfall is obtained during the Northeast monsoon season; 30–40 percent during intermonsoonal months and 12–20 percent during the Southwest monsoon season. In the rainshadow areas in the Uva Basin, maximum rainfall is received during the intermonsoon months, with fairly heavy rainfall during

Fig. 2 Relief

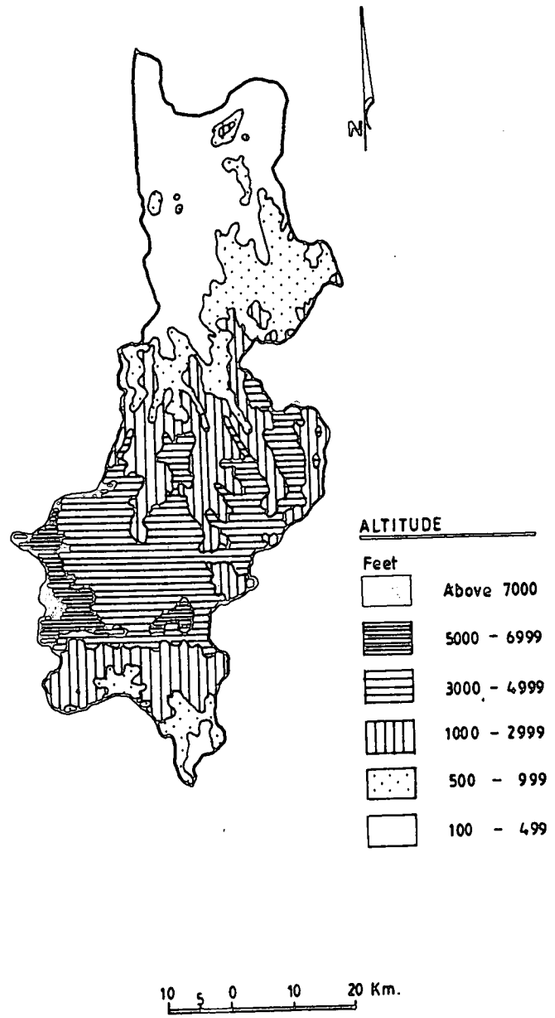
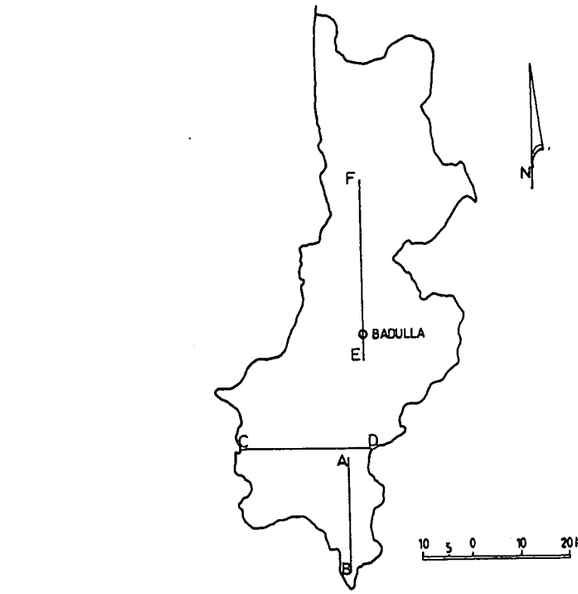


Fig. 3 Cross-Profiles of Selected Areas



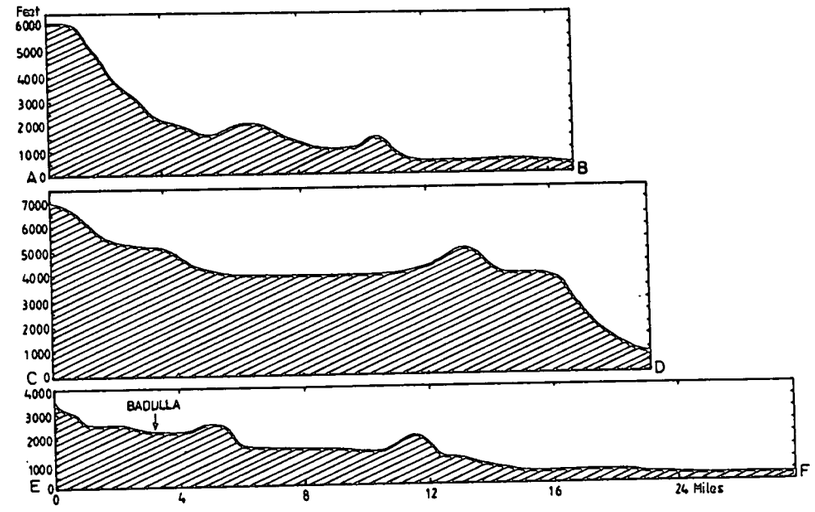
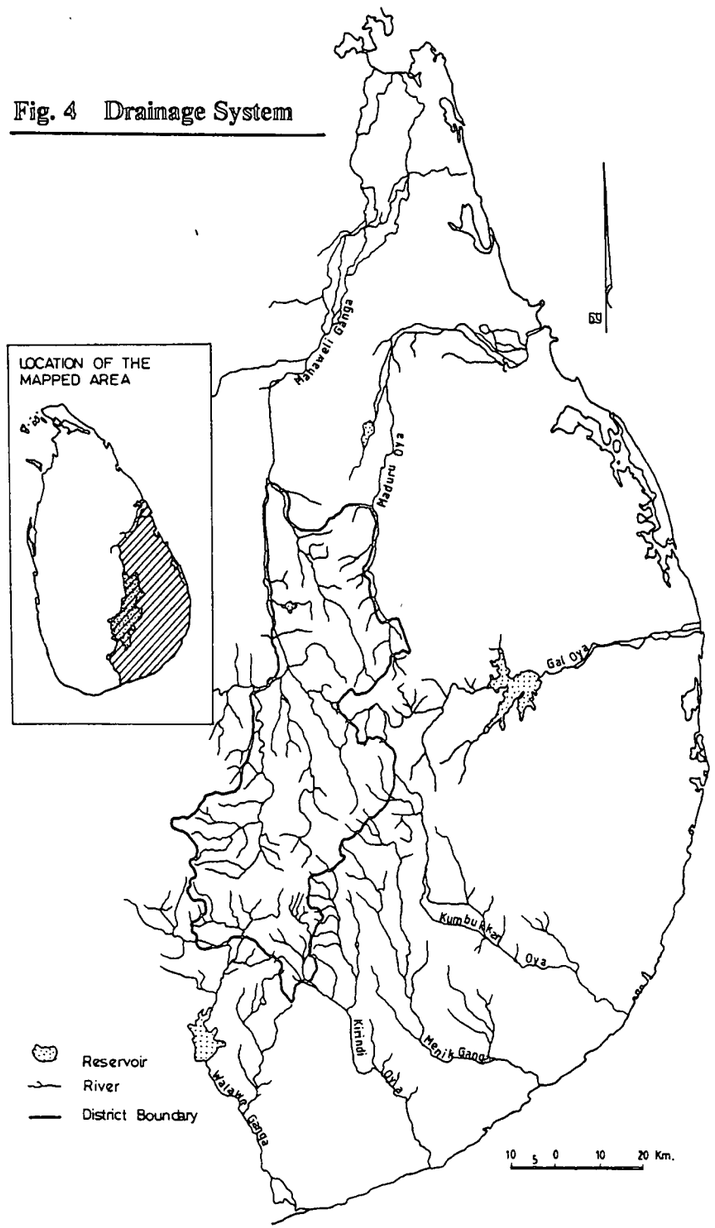


Fig. 4 Drainage System



Northeast monsoon. At Badulla and Diyatalawa (Table 2.1) 47 and 43 percent of the total annual rainfall is obtained during the 4 intermonsoon months of March, April, October and November respectively. Only 21 and 22.9 percent respectively is received during the Southwest monsoon. However, the Northeast monsoonal rain is significant bacause 34.8 and 25.6 percent of the total rainfall of these two stations is received in December, January and February. Along the Southern and Eastern edges of the Uva Basin, at higher level, the rainfall during the Southwest monsoon exceeds that of the Northeast monsoon season. On the other hand, Haputale located on the crest of the escarpment acquires 50 percent of its annual rainfall during intermonsoon months.

TABLE 2.1

MEAN SEASONAL DISTRIBUTION OF RAINFALL (%)

Station	*Convectional March-April*	*S.W. monsoonal May-September*	*Convectional Cyclonic Oct.-Nov.*	*N.E. monsoonal Dec.-Feb.*
Badulla	17.12	21-02	26.29	34.87
Diyatalawa	19.15	22.94	30.28	25.62

Source: K. U. Sirinanda, 1983 *in Climate, Water and Agriculture in Sri Lanka* ed. by M. M. Yoshino, I. Kayane and C. M. Madduma Bandara, University of Tsukuba, Japan.

The rainfall in the district is subject to interannual, seasonal and monthly variations. In the Intermediate Zone to which more than 85 percent of the district belongs, the co-efficient of variation of monthly rainfall is as follows:

TABLE 2.2

VARIATION (COEFFICIENT VARIATION) OF MONTHLY RAINFALL (%)

Month	*Variability*
January	56–66
February	57–59
March	35–42
April	31–35
May	70–76
June	38–41
July	43–53
August	54–51
September	49–51
October	30–36
November	27–29
December	36–43

Source: K. U. Sirinanda (1970), The development of models for synoptic analysis in the tropics. *Cey. Geographer* 20, 39-56.

Drought is an important climatic characteristic in the Badulla District. Partial drought[1] occurs very often during the months of February to July in the Intermediate Zone. Although no data are available for the drier parts of the district it is very likely that absolute more than partial drought is characteristic of these parts.

Local winds have an impact on the temperature, humidity and the agricultural activities of the district. During the Southwest monsoonal months the district experiences foehn-like winds known as '*Kachchan*' that have an average of 65–80 km/hour with a maxima of 150 km/hour. Wind gaps in the mountain ranges increase the wind speed but towards the Eastern edge of the Uva Basin wind speeds decline. Due to the katabatic movement of air and

1 Partial drought month — each day of which an average rainfall of at least 0.1 inch is received.

the associated adiabatic warming, the Kachchan has a drying effect. It lowers humidity of the air and increases the temperature. Similar winds of Northeast monsoon origin occur in January but they are weak and of short range.

During the Southwest monsoon season the district enjoys more sunshine. On the average the sunshine duration exceeds 5 hours per day but during October to January there is a deficit of sunshine.

The average annual temperature of the district varies between 20° to 25° C depending on the altitude. At Badulla (670 m) the average temperature is 23.2° C. At higher altitudes as at Passara (1007 m) and Diyatalawa (1248 m) temperature fall to 21.3° C and 20.2° C respectively. Due to the influence of dry and warm katabatic winds the temperature gradient for stations located on the leeward side of the central highlands is 0.5° C per 100 metres as opposed to the normal lapse rate of 0.65° C per 100 metres on the Western slopes.

The mean annual range of temperature at Badulla and Diyatalawa is 3.2° C and at Passara it is 3.5° C. The mean diurnal range of temperature is higher than the annual range and varies from 9.8° C at Badulla, 8.8° C Diyatalawa to 7.4° C at Passara. The period of greatest diurual temperature range occurs during the Southwest monsoon due to the influence of Kachchan winds. At Badulla for example, the temperature range in July is as high as 12.2° C.

Three agro-ecological zones can be identified within the district viz; the upcountry Wet Zone, the Intermediate zone and the Dry Zone (Fig. 5).

Soils

The drier lower areas of the district have red earths and brown loams. The relatively wet higher slopes are characterized by highly leached red-yellow podsols, while their lower slopes have lateritic reddish brown soils.

Natural Vegetation

The natural vegetation of the district consists of non-productive Wet-Zone forests, non-productive Intermediate Zone forest, scrubland and grasslands. The dense and open forest lands mentioned above comprise only 19.6 percent of the land area and covers 55,450 hectares (Table 2.3).

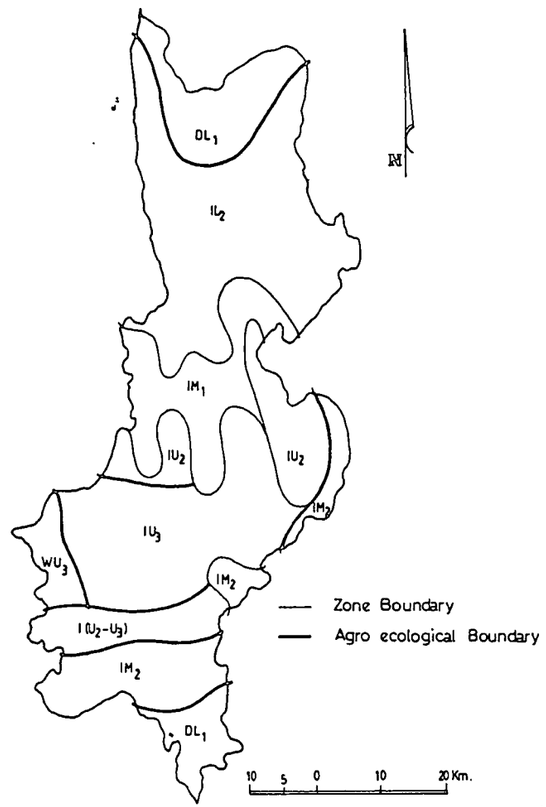
TABLE 2.3

LAND USE
AREA FIGURES BADULLA DISTRICT

	Mahi yan-gana	Ridi-mali-yadda	Kande-ketiya	Miga-haki-vula	Sora-natota	Pas-sara	Uva Parana-gama	Hali-Ela	Badulla	Weli-mada	Hapu-tale	Ban-dara-wela	Ella	Hal-dum-mulla	*District* Total ha.	in %
Built-up Land	70	70	–	–	–	10	–	–	230	20	330	130	–	–	860	0.3
Ass. Non. Agri. Land	10	–	–	–	–	–	–	–	–	–	–	–	–	–	10	0.0
Homesteads	4740	5030	1440	1340	1190	2350	2970	2780	1940	4210	1110	2360	1510	2260	35230	12.5
Tea	–	–	400	550	950	7630	2680	4880	4200	2320	1580	1970	4210	4650	36020	12.8
Rubber	–	100	240	20	–	–	–	–	–	–	–	–	–	600	960	0.3
Coconut	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mixed Tree and other Perennial Crops	–	–	20	–	70	20	40	30	60	–	–	40	240	520	0.2	
Paddy	4830	3250	2360	770	490	1020	1830	1020	660	1870	270	500	520	620	20010	07.1
Sparsely used Cropland	29770	14590	7580	5360	2810	7480	2640	1410	1040	1830	20	400	1390	7860	84430	29.9
Other Cropland	830	530	60	–	20	50	1500	250	210	1570	10	50	1180	6260	2.2	
Dense Forest	4790	1090	210	70	90	870	240	70	620	1900	10	40	290	10660	20950	7.4
Open Forest	11910	10820	1400	860	680	2640	70	210	40	290	–	30	510	5040	34500	12.2
Forest Plantations	180	220	70	10	20	1080	340	200	90	2500	330	620	490	6740	12890	4.6
Scrubland	2620	5100	1570	–	350	1210	480	800	20	60	40	260	610	1120	14240	5.1
Grassland	–	360	40	1030	120	2590	390	700	160	1360	380	620	1090	1390	10230	3.6
Water	1690	810	270	90	40	–	140	100	50	110	10	–	80	3400	1.2	
Barren Land	600	420	–	–	–	20	10	–	10	–	–	–	–	630	1690	0.6
Total Area	62040	42390	15660	10100	6830	26970	13330	12450	9330	18040	4340	4030	10620	43070	282200	100.0

Source: Sri Lanka / Swiss Remote Sensing Project 1986.

Fig. 5 Agro-Ecological Zones



DL_1	Dry Zone	Low Country	> 30	75% EXPECTANCY VALUE OF ANNUAL RAINFALL inches.
IL_2	Intermediate Zone	Low Country	> 45	
IM_1		Mid Country	> 55	
IM_2			> 45	
IU_2		Up Country	> 55	
IU_3			> 45	
WU_3	Wet Zone	Up Country	> 55	

Forest plantations cover 12,890 or 4.6% of the district. There are 10,230 hectares under dry patana grassland especially in the crests and upper slopes of hills in Passara, Ella, Haldumulla and Migahakivula where soils are shallow. The 14,240 hectares of scrubland are concentrated predominantly in Mahiyangana and Ridimaliyadda. These scrublands are the result of the abandoning of chena lands after constant cultivation.

Land Use

The land use pattern depicted in Table 2.3 indicates that built-up areas; their associated non-agricultural lands and homestead gardens comprise only 12.8 percent of the total area. Cropland covers 52.5 percent although more than half this area is sparsely cropped mainly under chena cultivation.

Tea

The district is the third largest tea growing area in the island with 15.5 percent of Sri Lanka's tea estates and small holdings concentrated here. Tea is grown on 36,000 hectares or 12.8 percent of the area. Estates and large holdings of over 20 hectares comprise 88 percent of tea lands. Over 9600 small holdings grow tea on 4500 hectares. The Tea Commissioner's Division has registered only 7428 small holdings. The size classes of the registered holdings shown in Table 2.4 reveal that more than half the small holdings are below 2 hectares in extent.

TABLE 2.4

SIZE OF TEA SMALL HOLDINGS

Size	*No.*
0.1 — ha.	1193
0.1 — 0.2 ha.	2276
0.2 — 0.405 ha.	2453
0.4 — 2.023 ha.	1136
2.023 — ha.	170
Total	7228

Source: Tea Commissioner's Division.

The predominantly tea growing areas are in the AGA's Division of Passara, Hali Ela and Haputale, where the physical environment favours the growth of good quality tea. In the Uva Basin, the medium altitude tea is of average quality but during the Southwest monsoon season when dry katabatic winds affect the tea bushes, yields decline but quality increases. However, the desiccating winds increase transpiration from leaves and accelerate the drying out of soil moisture. Shelter belts have been used to protect trees from wind damage.

Although the yield of tea (900 kg/hectare) is above the national average, yields can be improved further.

Other Perennial Crops

Only 4 percent of all the minor export crops grown in Sri Lanka is found in the district. Coffee, Cocoa, Cardamoms etc. are grown in only 0.5 percent of the total land area either in pure stands or in mixed gardens. Coffee robusta is grown up to 1000 metres and coffee arabica above this level.

Paddy

Paddy is the second most important crop in the district although, it is grown only in 7.1 percent of the area (over 20,000 hectares). This is approximately 2.65 percent of the total paddy lands in Sri Lanka. During the *Maha* season over 95 percent of paddy lands in the district is cultivated but during the *Yala* the cropped area is reduced to less than 45 percent. However, the cropped extent under major irrigation schemes during *Yala* is about 60 percent of that of the *Maha* season. Under minor irrigation schemes it falls to 45 percent of the area. In *Yala* rainfed paddy cultivation is almost negligible.

The significance of irrigation to paddy cultivation can be assessed by the fact that even in the *Maha* season only about 10 percent is cultivated under rainfed conditions.

Over 16,000 hectares are under irrigation of which 8,600 hectares are commanded by 6 major irrigation schemes such as Nagadipa and Bathmedilla. Paddy is the only crop grown in the major schemes. Minor schemes commanding 600 hectares or less grow potatoes and vegetables in addition to paddy.

The average yield of paddy is 3000 kg. per hectare. In the lowland areas, the yield is comparatively lower —2500 kg. while in the medium and upland areas the yield increases to 3500 kg. per hectare. The yield per hectare is higher in the minor irrigation schemes.

Minor Food Crops

Minor food crops such as cereals (maize, kurakkan) pulses, legumes, chillies and vegetables are grown in market gardens or chenas. Badulla is the largest potato and vegetable growing district in the island especially in higher elevations of Bandarawela, Haputale, Uva Paranagama and Welimada AGA divisions. Of the total land area under minor crops in Sri Lanka, 8.2 percent is concentrated in the district.

Land Tenure

Nearly one half of the cropland in the district is owned by individuals. 41 percent of farmers who own land cultivate less than 4 hectares while 7 percent is owned by farmers who cultivate 4-20 hectares of land. Another 14 percent of the farmers in the district cultivate land by obtaining licenses annually. The larger tea estates are owned and managed by the Public Corporations. Table 2.5 given below indicates the number of operators and the number of holdings in the district. There are 9630 (14 percent) landless operators. Thirty-two percent own only homestead gardens.

TABLE 2.5

OWNERSHIP OF HOLDINGS

	No. of operators	*Area (acres)*
Owning homestead gardens only	22,360	18,660
Owning homestead gardens and other lands	27,350	63,460
Owning other lands only	10,380	17,550
Landless	9,630	–
Total	69,720	99,670

Source: Department of Census and Statistics, 1981.

Livestock Farming

Badulla is not a great livestock rearing district. Unlike Mullaitivu, Mannar, Batticaloa or Vavuniya Districts where the proportion of neat cattle per 100 persons employed in agriculture is over 300, Badulla District has only 34 per 100 agricultural population. There are over 11,350 cattle owners of whom 8850 live in hilly areas, 50 percent of these are estate workers. The average herd size in these areas is 2.6 but in the lowlying areas it increases to 5.2. The buffalo population is 11 per 100 engaged in agriculture which is quite low when compared to 166 and 159 for Trincomalee and Batticaloa Districts. The largest concentration of cattle and buffalo population in the district, is in the AGA divisions of Ridimaliyadda and Mahiyangana. In 1981 its polutry population numbered 117 per 100 agricultural workers while that of Gampaha and Colombo Districts recorded 2757 and 1611 per 100 respectively.

Industries

The district is not industrially developed since only 11.6 percent of its employed population is engaged in industrial activities and because the total number of industries in the whole district amounted to only 1166 in 1981. The industries are predominantly agro-based (Table 2.6). Food and beverages comprised 60 percent of its

industries while the proportion of timber and furniture industries was 11.5 percent of the total. The building material and light engineering industries come third and fourth in the order of importance.

Population and Settlements

At the Census of 1981, 640,952 persons were enumerated and the intercensal growth rate between 1971-1981 was 4.2 percent. The average annual growth rate of 0.43 percent was one of the lowest recorded for the country. The low growth rate experienced by Badulla District as opposed to other Dry Zone districts is due to its net outmigration which exceeds its net increase by 80 percent. This excessive outmigration has been induced by the repatriation of Indian Tamil population.

TABLE 2.6

PERCENTAGE ANALYSIS OF INDUSTRIES BY TYPE IN THE BADULLA DISTRICT (1981)

Type of Industries	*Number*	*Percentage*
1. Food and Beverages	696	60.0
2. Timber and Furniture	133	11.5
3. Paper and Printing	8	0.7
4. Leather and Leather goods	2	0.1
5. Rubber and Rubber Products	4	0.3
6. Building material industries	11	10.3
7. Vehicle Services and repairs	41	3.6
8. Light Engineering	105	9.0
9. Servicing industries	16	0.9
10. Chemical Fertilizer	7	0.6
11. Gems and Jewellery	35	3.0
Total	1166	100.0

Source: Industrial Development Board Regional Office, Badulla.

More than one-third of the population in the Badulla District are children below 15 years; and 60 percent are between the ages 16 and 65 years. The majority is Sinhalese Buddhists. In addition to Sinhalese (69 percent) there are Indian Tamils (20.2 percent), Sri Lankan Tamils (5.9 percent), and a small proportion of Moors, Malays and Burghers. The predominant religions are Buddhism and Hinduism with 68.8 percent and 24.3 percent followers respectively.

The degree of urbanization is 8 percent. The district capital is Badulla with a population of 32,954 in 1981. At the 1981 census there were 2 towns administered by Urban Councils and 3 administered by Town Councils.

An interesting feature in the urbanization of the district is the stagnation or decline of many towns. With the exception of Bandarawela U.C. which had grown at the rate of 2.24 percent per annum and Lunugala Town Council with a growth rate of 1.88 percent, the other towns had experienced either very low or negative growth rates (Table 2.7).

There are 1132 villages in the district and a rural population density of over 650 persons per square km in the AGA divisions of Badulla, Bandarawela and Haputale. The four Northern AGA divisions and the Southernmost division are sparesly populatd (less than 150 persons per square km.).

Employment

The activity rate of the population of over 10 years is approximately 50 percent (45 percent employed and 5.2 percent unemployed). The male activity rate is as high as 64.9 percent. The peak active age span for males is in the age group 30–44 years with 94.7 percent being economically active. Badulla is one of the districts with a high female activity rate of 35.9 percent.

TABLE 2.7

GROWTH RATES OF URBAN CENTRES

Urban centres		*Population* 1971	1981	*Inter-censal* increase	*Average* annual increase %
Badulla M. C.		34,658	32,954	-1704	-0.49
Bandarawela U. C.		4,037	4,941	904	2.24
Haputale U. C.		2,404	2,432	28	0.12
Hali-ela T. C.		2,569	2,694	125	0.49
Passara T. C.		3,197	3,225	28	0.09
Lunugala T. C.		2,357	2,801	444	1.88
Welimada T. C.		3,469	3,431	-38	-0.15

Source: Dept. of Census and Statistics.

In the urban sector the activity rate amounts to 46.7 percent which consists of 37.5 of employed and 9.2 percent of the unemployed. There is a high percentage of economically active population in the rural sector (51 percent) where 45.1 percent are employed.

Of the total number employed, 70 percent are engaged in agricultural and other primary activities, 11.6 percent in secondary activities, and 15.3 percent in tertiary activities (Table 2.8). Among the employed, 52 percent are working as government and semi-government employees. Employees and own account workers comprise 27 percent of the total. The rest comprise 'other employees' and unpaid family workers.

TABLE 2.8

EMPLOYED POPULATION BY OCCUPATION

Occupation	*Total*	*Percent*
1. Agriculture, animal husbandry, forest workers and fishing	153,096	70.36
2. Production and related workers, transport equipment operators	25,275	11.61
3. Professional, technical and related workers	8,856	4.07
4. Administrative and managerial workers	761	0.34
5. Clerical and related workers	7,657	3.51
6. Sales workers	9,385	4.31
7. Service workers	6,775	3.11
8. Workers not classified by occupation	5,773	2.65
Total	217,578	100.00

Source: Census of Population and Housing, 1981, Badulla District Report, Vol. I - Part XXI.

Both male and female unemployment rates had declined by 3.7 and 3.0 percent respectively in 1981. Today the district has a moderate unemployment rate of 10.4 percent.

Housing Conditions

In 1971 as much as 79 percent of the housing stock was semi-permanent and only 19.2 percent could be regarded as permanent dwellings. By 1981 the proportion of permanent houses had increased to 33.7 percent of the total.

The average number of rooms in the urban and rural houses was 3.3 and 3.1 respectively, while the estate sector dwellings had on the average 1.7 rooms. Average number of occupants per room in the urban and rural sectors is 1.7 while in the estate sector it is slightly higher with 2.7 occupants per room. The rural sector had more owner

—occupied houses than the urban sector (82.7 percent as opposed to 58.9 percent.). In the rural sector only 21 percent of houses had access to tap water in 1981 whereas 80 percent of the dwellings in the estate sector was supplied with pipe borne water. In the district as a whole, this proportion is 43.5 percent. Flush or water-seal toilet facilities are available to only 21.9 percent of all housing units. In the urban sector more than half the houses are supplied with electricty but it is available to only 9.2 and 3.8 percent of the houses in the rural and estate sectors respectively.

The National Housing Development Authority has already constructed or aided in the construction of over 2500 houses in model villages, aided self-help housing schemes etc. (Table 2.9).

TABLE 2.9

HOUSING SCHEMES IN THE DISTRICT

Type of Housing	*No. completed*	*No. under construction*	*Total*
Model village	1560	30	1530
Electoral housing	465	120	585
Aided self-help housing	460	344	804
Public servant's quarters	22	–	22
Direct construction	98	–	98
Total	2545	495	3039

Source: National Housing Development Authority.

Infrastructure

The district is connected to major cities in the neighbouring districts and to Colombo by rail and roads (Fig. 6). There are 1600 km. of roads of which 1200 km are said to be paved. The density of metalled and tarred roads per sq. km. of land area was 43.7 km. which is relatively high when compared to other dry zone districts. Further, the density of 'A' class roads was relatively higher (6.5) than the average for Sri Lanka which was 5.9. However, the density of motorable gravelled roads (3.6 km. per 100 sq. km.) of land area was much lower than the country's average of 7.2.

There are 499 schools in the district with a school going population of 159,000. The teacher-pupil ratio is 1:24. Its literacy rate of 76.5 percent is considerably lower than the country's average of 89.5 percent and it is one of the least literate districts in the island. The literacy rate among males is higher (84.7 percent) than that for the females (68.2 percent).

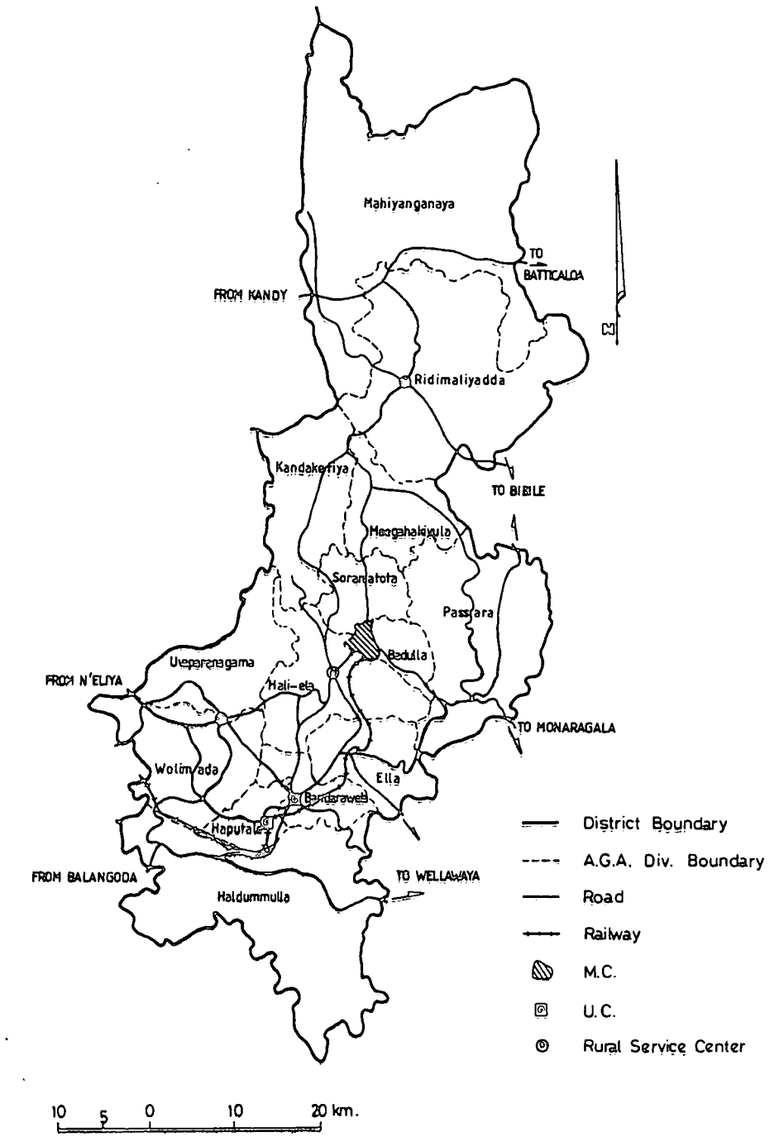
The primary school enrolment ratio of 67.37 is also the lowest for the island. However, the school attendance of children has improved over the years. The number of 5-9 year old attending school has increased from 54 percent in 1971 to 81 percent in 1981. The attendance of children between the ages 10–14 years has increased from 64 to 80 percent during the same period.

When considering the educational attainments of persons over 30 years of age, it was found that 31.8 percent of persons in this age group had never attended school. For Sri Lanka as a whole only 18 percent of this age group has had no schooling. Further, only 4.7 percent had passed GCE(O.L) in 6 or more subjects as opposed to the national average of 6.6 percent. Higher education has been received by only 2.1 percent.

There are 38 hospitals with a total of 1534 beds. The inadequacy of health facilities in the district is reflected in the number of health auxiliaries per 10,000 persons. Badulla is one of the districts with a very low ratio of Medical Officers and Nurses (Table 2.10).

The infant mortality rate of 51/1000 is higher than the national average of 42/1000, and the life expectancy of 54 years is lower than the national life expectancy of 69 years. The nutrition status of pre-school children indicates that there is high chronic undernutrition (height for age <90% and weight for height not < than 80%) which

Fig. 6 Transport Linkages



amounts to 33.2 percent. This amount is the second highest for the country. Severe malnutrition (when a person's weight for age is <61.1%) according to Gomez classification is 2.3 percent in Badulla District. It is, therefore, the district having the third highest rate of severe malnutrition in the country. On the other hand mild (90–76%) or moderate (76–61%) malnutrition rates are comparatively lower than those for districts such as Nuwara Eliya, Puttalam or Kurunegala.

TABLE 2.10

HEALTH PERSONNEL PER 10,000 POPULATION - 1981

	Medical Officers	*Nurses*	*P. H. I. I Attendents*		*Midwives* *Hospital*	*Public Health*
Badulla	1.70	3.50	0.32	2.5	0.58	1.11
Sri Lanka	2.11	4.66	0.61	3.26	0.95	1.23

Source: Dept. of Census and Statistics, Socio-Economic Indicators of Sri Lanka, 1983.

Resume

The foregoing analysis shows that the standard of living in the district is considerably lower than that of the majority of districts in Sri Lanka. The literacy rate and life expectancy is lower while the infant mortality rate is high. Nearly 38,000 farmers are classed as poor. Leaving out Indian estate labour 42 percent of the population is below the poverty line.[2] As much as 46 percent of the farmers are either landless or own only homestead gardens. A significant proportion is engaged in chena cultivation. Agricultural productivity and production is low. Although unemployment among the economically active population is not acute there is seasonal unemployment and underemployment. The number of service centres is inadequate and they do not provide sufficient services to the hinterland. Among these service centres existing towns perform many functions, yet they are stagnating, and are not dynamic enough to attract economic activities.

Zone I of System C[3] of the Mahaweli Development Project falls within the district, but no new townships have been planned for this area. However, Mahiyangana will be upgraded to township status through the provision of additional facilities.

2 See *Integrated Rural Development for Badulla District.* (A peliminary project outline), Ministry of Plan Implementation (1980), p.19.

3 Zone I of System C includes the old Mahiyangana Colonization Scheme. Water for this area is supplied by four large tanks viz; Horabora, Mapakada, Dambarawa and Nagadeepa as well as by a number of small tanks.

CHAPTER 3

ENVIRONMENTAL PROBLEMS

As indicated in the previous chapter the Badulla District is predominantly rural and agricultural.[1] Hence in the ensuing discussion more emphasis is placed on rural than on urban environmental problems. Nonetheless, the urban environmental problems are discussed in some detail with reference to the urban centres of Badulla and Bandarawela which have municipal and urban council status respectively. Figure 7 depicts the environmental problems in the Badulla District by AGA division. It is evident from the map that problems are most acute in the divisions of Badulla, Passara and Uva Paranagama. They are least evident in some of the less densely populated divisions such as Haldummulla, Mahiyangana and Migahakiula. Deforestation is an acute problem in all AGA divisions, whereas problems caused by gemming, quarrying and sand mining are more localized. Major landslides have occurred in nine of the fourteen AGA divisions. Although problems such as soil erosion and pollution of water courses are widespread, in one form or another, in all AGA divisions their occurrence is more noticeable in some divisions than in others.[2]

Deforestation

In the Badulla District widespread deforestation gives rise to a series of interrelated environmental problems. Among these the more easily identifiable are those of soil erosion, earthslips, drying of springs, wells and water courses, and the silting of tanks, rivers and tributaries. It also adversely affects soil-moisture and ground-water conditions.

In the long-term it negatively alters the macro and micro-environments. Unplanned forest felling has economic implications too in that, it results in the failure to satisfy on a sustained basis, the demand for fuelwood and timber.

The forest cover in the Badulla District is estimated at 68340 ha. which is approximately 24.2 percent of the land area. Open forest is most evident in Mahiyangana (11910 ha.), Ridimaliyadda (10820 ha.) and Haldummulla (5040 ha.). The same three divisions are also important in terms of the dense forest cover, which is less than the open forest cover in Mahiyangana (4970 ha.) and Ridimaliyadda (1090 ha.). In Haldummulla the dense forest cover (10660 ha.) is twice the extent of the open forest cover.[3]

Field evidence suggests that several causes contribute to deforestation. For the district as a whole, the most important source of cooking fuel is firewood. In 1981, 94.2 percent of housing units in the Badulla District used firewood as the principal source of cooking fuel.[4] The use of other sources (kerosene, electricity and gas) was negligible. Fuelwood extraction is also inextricably tied-up with poverty and the need for rural livelihoods. To some segments of the rural poor who are without sustainable livelihoods, fuelwood extraction provides income generation opportunities, as evident especially in Mahiyangana and Migahakiula AGA divisions. Similarly a considerable amount of forest removal is also attributable to chena and tobacco cultivation. Here again, the question of rural livelihoods assumes importance.

However, it is also found that illicit felling of forests for timber, on an organized scale, is undertaken by individuals and groups some of whom have the capacity to act with impunity. It was revealed that the illicit hauling of timber is well planned and undertaken at night specially on weekends and public holidays to aviod detection by

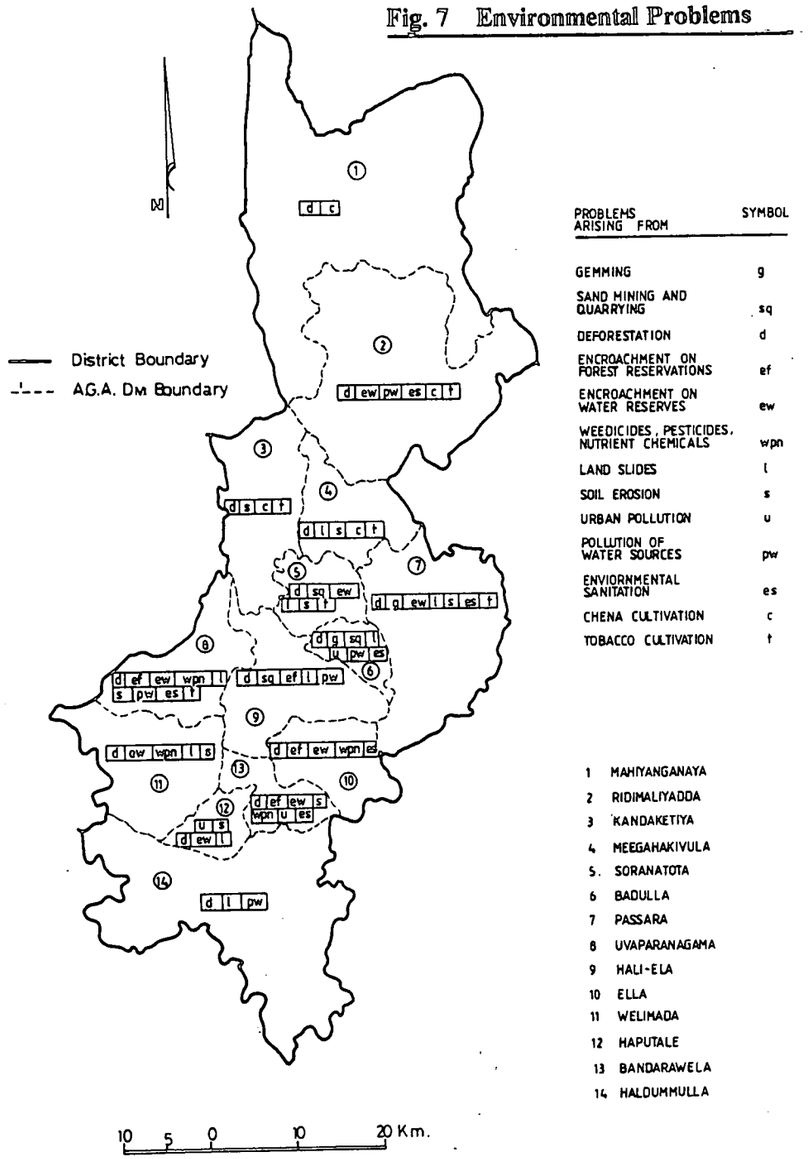
1 As used here the term 'rural' also denotes the estate sector.

2 However, this is a subjective assessment which needs to be verified by field measurements extending over a period of time.

3 *The Sri Lanka/Swiss Remote Sensing Project: The Activities in 1985.* Sri Lanka Survey Dept./Swiss Directorate for Development Cooperation (1986). Colombo.

4 *Census of Population and Housing 1981 — Badulla District Report,* Department of Census and Statistics, Colombo.

Fig. 7 Environmental Problems



PROBLEMS ARISING FROM	SYMBOL
GEMMING	g
SAND MINING AND QUARRYING	sq
DEFORESTATION	d
ENCROACHMENT ON FOREST RESERVATIONS	ef
ENCROACHMENT ON WATER RESERVES	ew
WEEDICIDES, PESTICIDES, NUTRIENT CHEMICALS	wpn
LAND SLIDES	l
SOIL EROSION	s
URBAN POLLUTION	u
POLLUTION OF WATER SOURCES	pw
ENVIORNMENTAL SANITATION	es
CHENA CULTIVATION	c
TOBACCO CULTIVATION	t

1 MAHIYANGANAYA
2 RIDIMALIYADDA
3 KANDAKETIYA
4 MEEGAHAKIVULA
5. SORANATOTA
6 BADULLA
7 PASSARA
8 UVAPARANAGAMA
9 HALI-ELA
10 ELLA
11 WELIMADA
12 HAPUTALE
13 BANDARAWELA
14 HALDUMMULLA

the authorities. In the Haldummulla area, the Weli-oya is being used for the illicit transportation of timber to avoid the road check point at Kalupahana.[5]

Another form of deforestation is caused by setting *patanas* on fire. The *patanas* are montane grasslands covered with coarse grasses. However, patches of forest (usually of stunted trees) occur in the moister sites, especially in valleys and ravines associated with water courses. In the Badulla District they occur at elevations ranging from 2500 to 5000 feet. The practice of setting them on fire is primarily undertaken as a means of providing succulent grass for browsing cattle and as a means of clearing the land for chena. There are others who resort to the practice simply to poach or to collect bees honey.[6] The burning of *patanas* not only destroys the localized patches of forest referred to above but also poses a serious threat to afforested plantations. It also induces soil erosion.

Chena Cultivation

It has been mentioned that chena cultivation is a factor contributing to deforestion. However, from an environmental perspective the implications of chena cultivation are far more complex. It not only conduces to soil erosion but under shortened fallows prevents the re-establishment of the forest cover, thereby impeding the capacity of the soil to nourish itself. It has been estimated that until recently about 20,000 to 24,500 ha. were annually brought under chena cultivation, although the figure has tended to decline to about 8000 ha. to 12000 ha. in view of the ban on encrochements now being enforced.[7]

In the Badulla District chena cultivation is most evident in the AGA divisions of Mahiyangana, Migahakivula, Kandaketiya, Ridimaliyadda and Soronatota. Chena has been a traditional activity which has both supplemented and complemented paddy cultivation. But today it is mostly undertaken by people with little or no land. It is found that chena activity takes place either on encroached upon State Land or less significantly in private lands. The extent of land cultivated by a family unit varies between 0.6 ha. to 2.4 ha. depending on the size of family and the availability of land. It may be noted that the chena plots of individuals may be in several locations, which is an indication of a growing land scarecity (measured in terms of soils, slopes, ground-water availability etc.). This in turn leads to accelerated deforestation and the utilization of steeper slopes (with more than 40° gradient) as found in parts of Kandaketiya. Another noteworthy feature is that the fallow periods which provide for the re-establishment of the forest cover are getting shorter with detrimental consequences to the environment. In the course of field investigations instances were noted where the fallow period is from one to two years or less.[8]

Tobacco Cultivation

Environmental degradation is also caused by tobacco cultivation. It is most prevalent in the AGA divisions of Kandaketiya, Migahakivula, Passara, Ridimaliyadda and Uva Paranagama. The cultivation is undertaken on private land or on State land, obtained on lease. The Department of Agriculture regulates the extents brought under cultivation, and it is also responsible for the issue of fuelwood permits. The registered cultivators are required to adhere to soil conservation measure such as terracing and the provision of contour drains.[9] The utilization of steep slopes with gradients exceeding 40° is strictly prohibited. However, in many areas there is a great deal of slackness (Ridimaliyadda division is an example) in the adoption of soil conservation practices. The cultivation of tobacco is also found on encroached land. Absolutely no heed is paid to soil conservation or for the need to avoid steep slopes for cultivation by the encroacher cultivators.

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5 It appears, that at times, illicit felling of forests is undertaken with official connivance, backed by local power groups. Instances where government vehicles have been used for the transportation of illicit timber were also reported.

6 Some people burn *patanas* for no reason, other than pure amusement.

7 IRDP— Badulla: Preliminary Report (1980) Ministry of Plan Implementation, Colombo.

8 However, it must be stressed that as traditionally practised chena cultivation was an ecologically sound method of land utilization. Land selection for cultivation was based on traditionally determined criteria relating to soils, forest cover, plant species - e.g. water loving plants etc. Care was expended not to disturb the soil, and the use of steeper slopes was avoided. The practice of mixed cropping was a simulation of nature, and above all the abandoned land was subject to a long fallow, which permitted the re-establishment of a climax or a near - climax in the natural forest cover.

9 Terraces 2½ feet high and 2 feet wide have to be provided at intervals of 30—40 feet and contour drains 1½ feet deep and 2 feet wide at 10 foot intervals.

The environmental implications of tobacco cultivation arise not only because it leads to soil erosion but also because it contributes to the destruction of the forest cover. Besides the removal of the forest cover to cultivate, there is also the heavy dependence of tobacco-barns on fuelwood to cure green-leaf. In some areas (Migahakivula AGA division) ameliorating steps have been taken by encouraging the barn-owners to procure and sustain fuelwood blocks; but the operation of illicit barns in tobacco growing areas complicates the issue and vitiates any easy solution to the problem.[10]

Encroachment on Reservations

Damage caused to forest reservations is reported from Bandarawela, Ella, Hali-Ela and Uva Paranagama AGA divisions. This again is a reflection of the lack of economic opportunities and the non-availability of suitable land for agriculture (although land itself may be available in view of the low overall density of population in the Badulla District). In some areas, for example, Bandarawela AGA division, felling of forest plantations is being done to meet fuelwood requirements. The present rate of afforestation is around 800 ha. Annually, systematically developed forests cover an extent of 12,890 ha.[12]

The encroachment on irrigation and other water reserves (eg. springs, water courses etc.) is more widespread and occurs in the AGA divisions of Bandarawela, Ella, Haputale, Passara, Ridimaliyadda, Soranatota, Uva Paranagama and Welimada. In Ridimaliyadda division the clearing of teak reservations for tobacco cultivation is also in evidence.

Soil Erosion

The reasons which contribute to soil erosion have already been discussed in relation to deforestation, chena and tobacco cultivation. In the case of both chena and tobacco cultivation, the utilization of steep slopes has further contributed to soil erosion. The fact that many people do not have title to land is a major reason for the neglect of soil conservation practices. They also find it time and labour consuming. Some chena cultivators question the need for soil conservation as they claim their forefathers had never been concerned with elaborate conservation measures.[13]

It is also observed that landslides bring in their wake large scale soil erosion. The absence of soil conservation at the requisite management levels is evident in some of the tea plantations. Although not realized a casual approach to road construction and management (which ignores the environmental implications) by the Department of Highways has also been a factor responsible for largescale soil erosion.

Land Slides

In the Badulla district at least nine AGA divisions (Badulla, Bandarawela, Haputale, Kandaketiya, Migahakivula, Passara, Soranatota, Uva Paranagama and Welimada) have seen the occurrence of landslides. Their occurrence is particularly evident during heavy rains and is the result of both the natural and man-made causes.[14] The extent of environmental damage caused varies with the type of earthmovement and the specific location. In the Badulla district, the following types of earthmovement have been identified:

— Subsidence
— rockfalls and cracks
— creep movement and localized earthslips
— partial slides
— creep movement and slides
— slide in the form of overburden slip and rock fall
— slide accompanied by mud-flow and rock fall.[15]

10 The Ceylon Tobacco Company, the largest sponsor of tobacco cultivation in the Island is conscious of the problem and in recent years had advocated and adopted several remedial measures. It has extracted residual forest in the Mahaweli System 'C' on government permits. In the long-term a scheme has been undertaken to have company fuel-blocks. Another method is that described above, which encourages each barn-owner to have his own fuel-block. Other approaches include the use of alternative fuels e.g. coir-dust and fibre-briquets. Technical solutions are also being sought e.g. modifications to the existing flue system used in furnaces may achieve a 37 percent saving on fuel.

11 It is contended by the officials of the Forest Department that encroachment on forest reservations is not very significant and usually involves reservations where the plantations have not been successful. However, there is some inconsistency in the information provided by the AGAs and the officials of the Forest Department.

12 The Sri Lanka/Swiss Remote Sensing Project (1986) op. cit.

13 This is a mistaken notion. See note 6.

14 For a technical discussion of the subject see National Building Research Organization, *Land Slide Hazard in Sri Lanka,* Vol. I, (1986) Colombo.

Use of Pesticides, Weedicides and Nutrient Chemicals

The problems arising from the use pesticides, weedicides and nutrient chemicals are most evident in the three divisions of Bandarawela, Uva Paranagama and Welimada where cultivation of vegetables is undertaken on a commercial scale. As traditional methods of weed and pest control are time consuming and less effective, compared to chemical weedicides and pesticides, there is general preference for the latter. The problem lies not in the use of chemical weedicides and pesticides *per se,* but in their excessive use — both in terms of quantities and the number of applications. This applies in equal measure to the use of nutrient chemicals.

Several environmental hazards result from the excessive use of chemical pesticides and weedicides. One consequence is that the sprayed pesticides and weedicides are washed down from elevated fields into the water courses below, thus contaminating the water supply. The same is true of nutrient chemicals. This is further exacerbated by the fact that the cultivators are in the habit of washing their sprayers, after use, in streams and water bodies. Further, the empty containers (bottles and cans) are thrown into them adding to the contamination.[16] There is also the direct comtamination of vegetables and other crops resulting from the excessive applications of weedicides and pesticides. Apparently no direct link has been established between the use of chemical weedicides and pesticides and public health, but it is conjectured that some respiratory and digestive ailments may be caused by them.[17] But some of the effects may be over the long-term, rather than the short-term. The effect of chemical applications on micro-organisms is too well known to be elaborated here.

Water and Sanitation

Water and sanitation too emerge as important environmental issues in the Badulla District. It is evident from Table 3.1 that for the district as a whole 26.6 percent of occupied housing units have no toilet facilities; while in the case of improvised housing the figure is even higher (57.6 percent). Pit latrines account for 43.3 percent of the toilets and a significant feature is that as much as 21.2 percent of the toilets are shared. The absence of latrines leads to open air defecation which is a common practice in rural areas, with all its attendent environmental problems.

TABLE 3.1

OCCUPIED HOUSING UNITS BY TYPE AND TOILET FACILITES

KIND OF TOILET

Type of Housing	*Total*	*Flush Toilet*		*Water Seal*		*Pit*		*Bucket Type*		*None*	*Not stated*
		Exclusive	*Shar-*	*Exclusive*	*Shar-*	*Exclusive*	*Shar-*	*Exclusive*	*Shar-*		
Total	100.0	3.0	.8	11.6	6.5	30.2	13.1	.7	.8	26.6	6.7
Permanent	100.0	6.7	.8	28.6	5.1	34.2	8.4	.9	.6	6.4	8.4
Semi Permanent	100.0	1.2	.8	2.6	7.3	28.5	15.7	.6	.9	36.5	5.9
Improvised	100.0	.1	.6	15.7	2.6	12.7	7.2	.0	.4	57.6	3.2

Source: Census of Population and Housing,1981.

The problems of environmental sanitation are further aggravated by the absence of safe-drinking water (Table 3.2). It is striking that in 13.8 percent of the housing units, the main source of drinking water is river, tank or other open water body; and the dependence on such sources is even higher in the case of improvised housing (25.4

15 NBRO (1986) op. cit.

16 There is a great need for situation specific studies to determine the extent of water contamination resulting from the above sources.

17 These views were expressed by medical personnel interviewed in the course of field investigations. Here again, there is a need for in-depth research on the subject.

percent). Furthermore, 14.9 percent of the occupied housing units depend on unprotected wells for their supply of drinking water. In the dry season access to safe drinking water is further restricted.

The above two factors in conjunction contribute to the prevalence of waterborne diseases. In rural areas with inadequate toilet facilities, open sources of drinking water are subject to contamination by viruses and bacteria. Even with open wells problems are encountered as the water is susceptible to contamination by bacterial and other polluting sources. In situations where wells are situated within close proximity to latrines and pits, they are easily contaminated by faecal coliform and other organic matter. Consequently, there is the spread of water-borne diseases such as typhoid, para-typhoid, cholera, dysentery, infective hepatitis, polyomylitis and enteritis. In the Badulla district, the incidence of all types of bowel diseases is approximately 100 per 100,000 population.[18]

Sand-Mining and Quarrying

Large scale sand-mining occurs in Badulla and Hali-ela AGA divisions. Extensive sand-mining leads to heavy erosion of the river banks. As a consequence of mining, there is virtually no sand in the bed of the Badulu-oya between Madiriya and Deiyannewela bridge, where the stability of the bridge itself is seriously undermined. In Hali-ela AGA division sand-mining is most evident in Hathapma, Medagama and Hali-ela gramasevaka divisions.

TABLE 3.2

OCCUPIED HOUSING UNITS BY TYPE AND MAIN SOURCE OF DRINKING WATER

			MAIN SOURCE OF DRINKING WATER													
			Piped Water				Protected Well				Unprotected Well		River Tank and Other Source		Not Stated	
	Total		Within Premises		Outside Premises		Within Premises		Outside Premises							
Type of Housing Unit	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Total	120182	100.0	18287	15.2	34000	28.3	9726	8.1	19141	15.9	17904	14.9	16529	13.8	4594	3.8
Permanent	40731	100.0	6926	17.0	12038	29.6	4533	11.1	6658	16.3	3897	9.6	3376	08.3	3302	8.1
Semi Permanent	77814	100.0	10973	14.1	21744	27.9	5136	6.6	12281	15.8	13680	17.6	12738	16.4	1262	1.6
Improvised	1636	100.0	389	23.8	216	13.2	58	3.5	202	12.3	327	20.2	415	25.4	30	1.8

Source: Census of Population and Housing, 1981.

Metal quarrying in unsuitable locations along the Badulla – Mahiyangana road had in the past resulted in many earthslips and may yet be potentially hazardous, unless well regulated. Quarrying of dolomite is again localized and is most evident in the Soranatota AGA division. Here too, quarries located in hazardous zones may induce landslides and indeed Soranatota is already a landslide affected area. Moreover, lime-kilns are contributing to deforestation (through demand for fuelwood) and air pollution.

Gem – Mining

Gem mining is mainly found in the two AGA divisions of Badulla and Passara.[19] Gemming is undertaken by two types of operator-licensed and the unlicensed. The licensed operators are required to adhere to certain regulations which have a bearing on environmental conservation. Thus, removal of forest and use of explosives is prohibited. Further, the dug-up earth, sand and rocks are not permitted to be removed from the site as it is a requirement that the 'pits' be filled-up after the mining activity ceases. In practice the capacity to enforce regulations is rather weak and the requirement to fill-up the excavations are very often observed in the breach. These unclosed pits with stagnant water provide breeding habitats for the malarial, and other types of mosquito.

The greater, damage, however, is caused by the unlicensed miners who resort to illicit gemming with least regard to the environmental damage that they cause. Illicit gemming has caused earthslips (Eliyamadiya) and other environmental hazards—damage to reservations (Puwakgodamulla—Hunukotuwa reserve) and paddy fields (Heensiripotha bordering the River Side road, Badulla) in the Badulla District. In Passara AGA division problems relating to gem mining are found in Lunugala town and in the gramasevaka divisions of Kolabowatta, Sapuroda and Kottalbedda.

18 See for example, *A National Plan For Safe Drinking Water* (1979) Vol. II, University of Moratuwa.

19 Other gem mining areas are Mahiyangana and Hasalaka AGA divisions.

Drought

As pointed out in chapter 2, drought is a natural hazard which affects practically all parts of the Badulla district. This has several implications. Firstly, it leads to extreme manifestations of seasonal deprivation and poverty. It also constrains the realization of sustainable rural livelihoods. For a proper perspective this situation has to be viewed against a background, in which a very high proportion of the people lives below the poverty line. Drought also creates seasonality problems, in the access to adequate supplies of drinking water, besides affecting its quality. Hence there is a higher incidence of water-borne diseases in dry than in wet spells.

Urban Environmental Problems

The three main urban centres in the district are Badulla, Bandarawela and Haputale. For the purpose of this report urban environmental problems were investigated in Badulla and Bandarawela. As earlier mentioned Badulla has municipal and Bandarawela urban council status.[20]

Within the urban area of Badulla and Bandarawela there is little land available for expansion resulting in overcrowding and pressure on land resources. In Badulla it has contributed to a spate of house-building activity, even utilizing land with steep gradients. Such building detracts from scenic beauty and undermines slope stability. Greater care needs to be exercised in the selection of sites especially for public housing.

Air pollution in the form of an early morning smog is a clearly visible environmental problem in the Badulla town. This is primarily attributable to smoke emanating from industrial plants and sites (sugarcane crushing plants and lime-kilns) which is trapped by the rim of mountains engirdling the town.[21]

The absence of safe-drinking water is acutely felt in the urban centres of Badulla and Bandarawela. In Bandarawela the two pumping stations do not have any filtering devise and the problem is compounded by the fact that approximately 30 percent of the population who are resident within the catchment area do not have proper toilet facilities.[22] Eventhough the water is chlorinated, it has little effect as the time interval between chlorination and distribution is generally insufficient for effective disinfection. This is because the town has to be provided with a continuous water supply, although the pumping capacity itself is low. In Badulla too the water is pumped from the Badulu Oya without being properly treated; and in fact, during heavy rains, mud and suspended particles are found in the water supply. Further, effluents from the government hospital, industrial units and hotels are discharged into the river, thereby making the water supply a potential health hazard. Badulla also lacks effective means of dealing with the rainfall run-off. This again is a potential health hazard, and also causes a great deal of public inconvenience.

Conservancy services leave much to be desired both in Badulla and Bandarawela. With the result public conveniences are unclean, and in Bandarawela, in view of the hilly terrain, the cleaning of bucket latrines is specially problematic. In both urban centres more could be done for the upkeep of the drainage and sewerage systems. The drains that have been provided for Bandarawela town show some design weaknesses and traps the garbage and refuse in them. The town hotel owners are also not very conscious of the need to keep the drains clean. Although garbage bins have been provided in Bandarawela town, they are insufficient to meet the needs of the town population. In Badulla too, although bins have been provided garbage disposal is not effectively undertaken. The dumping ground in the vicinity of the public park is not the ideal location for the purpose. The garbage dumps are also not adequately covered (with chaff) for sanitation purposes. Similar problems are evident in Bandarawela too, in regard to garbage disposal.

The quality of environmental amentity offered by both centres is rather poor. In Badulla, the public park is the haunt of bats and in Bandarawela the abattoir is a very ungainly sight. Indeed, it is surprising that Bandarawela has pretensions as a health resort.

20 Haputale too is an urban council area. A cursory examination shows that many problems especially relating to water and conservancy services are equally valid in respect of Haputale town. Prior to the enactment of the Development Councils *Act*, No. 35 of 1980 – Hali-Ela, Lunugala, Passara and Welimada were designated Town Council areas.

21 The extent of air-pollution thus caused needs to be well researched using measurement techniques; and possible long-term consequences on public health indentified.

22 Figure quoted by M. O. H. Bandarawela.

In passing it may be mentioned that the smaller service centres — Hali-Ela, Lunugala, Passara, Welimada and Mahiyangana too have problems, especially in relation to public conveniences and conservancy services. For example, the number of public toilets in Welimada is insufficient; besides, they are not kept in a clean and sanitary state. In Mahiyangana the seasonal influx of pilgrims creates special problems in regard to environmental sanitation.

CHAPTER 4

EXISTING METHODS OF ENVIRONMENTAL MANAGEMENT

This chapter examines the existing methods of environmental management in the Badulla district with reference to environmental planning, institutional machinery, capacity for implementation, community participation and people's perceived attitudes to existing methods of environmental management. It also evaluates three specific projects viz. land slide management, chena stabilisation and community forestry to provide an insight into the nature of environmental projects being implemented.

Environmental Planning

It is evident from field investigations that environmental planning has not been a focal area of concern of the district administration. What passes for environmental management is the purely routine undertaking of administrative functions by line departments such as Agriculture, Forest and Irrigation whose activities in general are more directly tied-up with environmental concerns. However, even in these departments, the approach is more regulatory than managerial. Given this situation, there is a lack of consensus concerning objectives and basic policies of environmental management; and indeed, in the district administration environmental considerations are very much in the background. Furthermore, in the absence of a systematic effort, the existing method of environmental management follows mainly a 'response approach' which is characterised by *ad hoc* reactions to particular situations.

It is relevant to note that even in the District Integrated Rural Development Programme for Badulla, environmentally significant projects, though included in the preliminary report, have been left-out from the World Bank appraisal report[1]. Indeed, the chena stabilisation project has been incorporated only at the implementation stage. Thus the World Bank Appraisal Mission did not earmark any funds for the chena stabilisation project and the amount allocated to forestry was a meagre two perceent of the overall estimated project cost of Rs. 242 million. However, a six percent allocation was provided for supplying safe drinking water. The major allocations were for irrigation and water management (30 percent), small-holder tea development (18 percent) and rural roads (23 percent)[2]. While these components are undoubtedly important from the point of view of rural development in the Badulla district, the long-term environmental benefits could have been appreciable had, wherever feasible, environmentally related sub-components been incorporated in the major project components.[3] In regard to small-holder tea development, the emphasis in the report is on infilling, replanting and new planting, and in the provision of infrastructure facilities. It would have been worthwhile to incorporate environmentally related sub-components, for example, on slope stabilisation (through provision of drains) or on prevention of soil erosion (through terracing and related conservation practices). Similarly, a sub-component for the conservation of irrigation reservations could have been incorporated in the main irrigation and water management component. It is significant that the Integrated Rural Development Programme makes no mention of the land slide hazard or propose any strategies to manage the same.[4]

In regard to the urban centres too a similar absence of a comprehensive planning effort which takes environmental considerations into account is noticeable. However, planning officers have been assigned to

1 See *Intregrated Rural Development Programme for Badulla District: A preliminary Project Outline*, (1982) Ministry of Plan Implementation and *Badulla Rural Development Project*, (1982) Staff Appraisal Report, IFAD.
2 P. S. Ramakrishna, "District Integrated Rural Development Programme — A Case Study of Plan Formulation for Badulla District", *Progress*, 3, 25—38.
3 For Project details see Staff Appraisal Report op. cit.
4 Ibid.

Badulla, Bandarawela and Haputale by the Urban Development Authority and preparatory work is being undertaken to develop integrated physical development plans for these urban areas.[5]

Institutional Machinery

The Badulla district administration is headed by the Government Agent (GA) who is an officer of the Department of Public Administration. There are fourteen divisions in the district, with each under an Assistant Government Agent (AGA). The divisions are in turn sub-divided into Grama Niladhari (GN) divisions which comprise one or several villages. Many government agencies have field organizations functioning at the divisional level, while a few reach even the sub-divisional level. It is found that some line departments are directly responsible to the GA. Among these there are departments with direct environmental concerns such as the Departments of Agriculture, Regional Development, Local Government and Agrarian Services. But many departments with environmental concerns are more independent of the GA. Examples are the Department of Health Services, Education, Minor Export Crops, Buildings, Highways and Irrigation. The statutory organizations which function at the district level (eg. Janatha Estate Development Board, Paddy Marketing Board, National Housing Authority and Tea Small Holdings Development Authority) are quite independent of the GA. The structure of the district administration has implications for environmental management both at the district and divisional levels as many departments with environmental concerns are not directly responsible to the GA nor the AGAs.

The district level decision making pivots on the District Development Council. It has an Executive Committee presided over by the District Minister who is a member of the Council. The District Development Council consists of all members of Parliament from the district in addition to the members elected by the popular vote of the people. By statutory requirement, the GA functions as the Secretary to the District Minister. The functions of the District Development Council include among others, the approval of the annual development plan and its implementation through the Executive Committee.[6]

Environmental planning has not been a major concern of the annual development plans; however, according to information provided by the AGAs, from time to time, environmental issues have been referred to the District Development Council for appropriate action. It is evident that the District Development Council has exercised planning controls in terms of Sections 18 (2) of the Act, which provides it with the authority to;

> "exercise, perform and discharge such powers and functions as were exercised, discharged or performed by a Town Council or a Village Council constitued for any town or village area situated within the administrative district for which a Development Council has been constituted."[7]

Within the district the urban nodes of Badulla, Bandarawela and Haputale are administered by urban local authorities, and in terms of Section 18 (1) of the Development Councils Act, they are independent of the District Development Council. While Bandarawela and Haputale are administered by Urban Councils, Badulla is assigned municipal status and therefore, governed by a Municipal Council.

At the grassroots many Gramodaya Mandalayas (Village Development Committees)[8] have been concerned with environmental issues (for example, community forestry, tree-planting campaigns and environmental extension), although as could be expected some Gramodaya Mandalayas have been more active than others. In the AGA divisions of Kandaketiya, Passara and Soranatota, there are several Gramodaya Mandalayas that have been active in the promotion of environmental conservation.

5 Under Section 3 of the Urban Development Authority Law No. 41 of 1978, the Minister can declare any area that is suitable for development as an 'Urban Development Area'. Currently, all district capitals and towns administered by urban councils have been declared 'Urban Development Areas'. Within such areas, the UDA is empowered by Section 8 of the UDA law to carry out integrated planning and physical development.

6 See Development Council Act, No. 35 of 1980.

7 Ibid.

8 See Section 5 of the Gramodaya Mandala Fund Act, No. 28 of 1982. Neither in the Development Council Act, nor in the Gramodaya Mandala Fund Act has environmental management being explicitly mentioned as coming within the purview of their functions.

In the absence of a statutory mechanism, the lacunae in respect of divisional level decision making was very much in evidence at the time of the survey. This has now been rectified with the recent institution of the Pradeshiya Sabhas.[9] The extent to which they could contribute to environmental management yet remains to be seen.

The powers, functions and duties of the Central Environmental Authority (which are primarily advisory in intent)[10] devolves on the District Environmental Agency (DEA) at the district level.[11] In terms of Section 9 (2) of the National Environment Act, the GA is the chairman of the DEA. The DEA has, by and large, been ineffective in the Badulla district. As far as could be determined, it had not even met regularly, let alone perform its advisory functions in relation to environmental affairs. Indeed, in response to the question" have you referred any environmental problem in your division to the DEA or any other authority?", only one AGA answered that the DEA had been informed. In every other case problems had been referred either to the GA or the institution or line department concerned. This tendency on the part of the AGAs may have been prompted by practical considerations, but highlights the fact that the DEA is very inarticulate in its role performance.

Capacity for Implementation

At the implementation level, environmental management in the Badulla district has had to contend with several problems. For obvious reasons, the responsibility for environmental management is distributed among several departments and the absence of coordination among them is keenly felt.[12] This is even more conspicuous in the absence of an overall perspective relating to environmental management. Consequently, there are situations in which the departments pull in different directions. In the Pattipola area, for example, the Department of Railways has leased out reservations bordering the railway line to individuals despite being cautioned against it by the AGA Welimada. The same lack of coordination has resulted in State land not being released expeditiously for environmental projects.

It may be noted that the size of AGA divisions also imposes certain constraints on the implementation capacity. Some AGA divisions are far too large in areal extent to be administered by a single AGA. In this connection Haldummulla, Mahiyangana and Ridimaliyadda divisions may be cited as examples. In the larger divisions, the Grama Niladhari divisions also tend to be correspondingly large. As such it is difficult to exercise vigilance over environmental offences. Even in the relatively smaller divisions, problems of accessibility hinder the mobility of frontline officials.

In the course of the field survey it also emerged that the lack of a clear demarcation of State land is a problem which has seriously affected the performance of environmental projects. This has, in fact, impeded the implementation of the community forestry project in both Haldummulla and Soranatota AGA divisions. There is also some evidence that the inter-district boundaries are also not well defined. For example, the indetermination of the administrative boundary between the Badulla and the Nuwara Eliya districts has raised problems in the conservation of reservations in the Pattipola area.

Environmental protection and conservation is also impeded by a lack of logistics support. The non-availability of vehicles for mobile patrols and the lack of communication equipment for field-officers were cited as problems which restricted the field operations of the forest department officials. Similar opinion was voiced by the AGAs in regard to illicit gemming and forest felling operations. Lack of manpower and funds also considerably affect the performance of these officials. The inadequacy of funds affected the implementation capacity of urban local authorities as well.

The legal procedure relating to environmental protection is slow and cumbersome and discourages many officials from taking effective action against offenders. Court procedure relating to forest offences was especially

9 Pradeshiya Sabhas were created by Act No. 15 of 1987. As in the case of DDCs, they have been empowered to exercise environmental controls in terms of the Town Council and Village Council Ordinances. It is reported that the Central Environmental Authority intends to delegate certain subjects and functions pertaining to environmental conservation and protection to the Pradeshiya Mandalayas (See Environmental News 1987, Vol. 3 No. 11 and 12, p.3)

10 See Section 15 to 12 of the National Environment Act, No. 47 of 1980.

11 Ibid Section 9 (1) and (3)

12 In theory, though not essentially in practice, the District Development Council and the District Minister System facilitate the coordination of activities of line departments within districts.

singled out by most AGAs. Fines are too low and the procedure time consuming and protracted. Furthermore, when illicit felling is detected, the officers concerned have to make arrangements to transport the seized timber to be produced in court, sometimes at own expense. They are also responsible for the safe-custody of timber pending legal action. In view of these difficulties, at times, the officials find it prudent to turn a 'blind-eye' to these activities. Under the Forest Ordinance, a person found guilty of a forest offence, committed by himself or made to commit by him run the risk of confiscation of all forest produce involved in the offence and all tools, boats, carts, cattle and motor vehicles used to commit the offence. In practice the fact that such cases are taken up under Section 306 of the Criminal Procedure Code (which permits the productions to be released) nullifies the impact of the action being persued, besides enabling the use of such tools and vehicles to repeat the offence.[13]

A point that repeatedly came up in discussions is that to minimize or contain forest offences the AGAs at the divisional level should be vested with the authority to impose summary penalties (eg. fines, confiscation of tools and equipment) against offenders.

Another point which relates to the legal process is that where the law itself is adequate but the implementation capacity is altogether lacking. This is well illustracted by the Control of Pesticides Act No. 33 of 1980. As rightly pointed out by Wijayadasa and Ailapperuma,

> "The institutional framework for enforcing all aspects of the current Act on pesticides has yet to be developed.... The available resources are sufficient for only undertaking activities associated with the registration process and for *ad hoc* checking on quality. The full evaluation of risks, associated with the use of pesticide to humans, domestic animals and environment must await infrastructural development."[14]

The absence of trained manpower for environmental protection and conservation is another drawback. Enforcement of regulations need to be backed by thorough 'environmental conciousness' on the part of the implementors themselves. It is only thus that the transition from a purely administrative (regulatory) system to a truly management (promotional) system could be achieved.

The apathy and the general disinterestedness of the lower rung officials of line departments was also cited as a problem which affects the capacity to enforce existing environmental legislation. It was hinted at the discussions, that there may be some degree of connivance between some of the lower rung officials and the offenders, especially in the illicit felling of forests. Implications of this problem are much wider and raise a host of questions relating to salaries, rewards, motivation and work-ethics etc. of the frontline officials. The experience in the Western Highlands of Gautamala is revealing in this respect:

> "The low salaries paid to government workers charged with environmental protection and control of resource use are another factor inhibiting environmental maintenance. A forest ranger or game warden who earns but $ 100 per month is a prime candidate for bribery to allow tree-cutting or poaching."[15]

There was also the frequently voiced complaint that environmental protection is subject to interference by local power groups who readily shield and support environmental offenders. Activities of this nature demoralises and frustrates the sincere officials. The action of 'local power groups' is most evident in respect of illicit gemming and timber operations. This is a matter which could be put right only by firm policital commitment at the Centre.

Community Participation

Community participation too needs to be looked at in relation to existing methods of environmental management. For the reasons averred to in chapter one, there cannot be effective environmental conservation without community involvement. In order to promote community participation environmental activities have been undertaken (such as tree-planting, poster exhibitions, and essay and art competitions for school children) on

13 Action has been taken to amend the Forest Ordinance so that the CPC cannot supercede the Forest Ordinance in this regard. See K.H. J. Wijayadasa and W. D. Ailapperuma, *Survey of Environmental Legislation and Institutions in the SACEP Countries — Sri Lanka,* CEA (n.d) pp 18 — 19.

14 K. A. J. Wijayadasa and W. D. Ailapperuma, Ibid p. 21.

15 D. R. Hoy and F. J. Belisle, "Environmental Protection and Economic Development in Gautamala's Western Highlands" *Journal of Developing Areas,* (1984), 18, 161—176.

environmental themes. These activities have usually been organized at the divisional level by the AGAs in collaboration with line departments. Extension on health and sanitation had been undertaken by the Department of Health Services. The ideal of people's participation is built in the community forestry project. Moreover in most AGA divisions Timber Committees and/or Forest Protection Societies have been formed at the grassroots to encourage forest conservation. These activities involving communities in environmental management have been supported by Rural Development Societies and Gramodaya Mandalayas.

However, several noticeable drawbacks need mention. The attempts to involve communities have not been effectively planned. It has mostly been a top-down process. In fact, there were very few village level voluntary organizations in the entire district (in so far as our-field information goes) of any standing, that had been formed and sustained through community efforts.[16] For the most part participatory activities have not been promoted on a continuing basis. Neither has there been follow-up action on activities that have been promoted. The official initiative has mostly concentrated on setting-up Forest Protection Societies but it is important that communities should be made to focus on the total environment, than on any particular aspect of it.[17] The very concept of community mobilisation has also been narrowly conceived. It should in essence mean not only the physical mobilistion of the community, but also the mobilisation of its indigenous knowledge base. It is being increasingly realized by environmentalists that rural people are the repositories of environmental knowledge, which is based on the selective experience of generations.[18]

How best could this knowledge be utilized in the present context? For instance how could the community contribute to the forestry programme through its knowledge of relatively rapid growing indigenous species of trees which could also provide multiple uses? What plants are more drought resistant? Or what habitats are best suited for a particualr species of bird or animal? Hence there is much that needs to be done to incorporate participatory processes in environmental management.

People's Perceived Attitudes

At the outset it was mentioned that environmental management in an extended sense means the management of the resource users as well. Therefore, for effective environmental management there has to be a good interactive relationship between the environmental managers (the adminstrators) and the resource users. In this context it was thought useful to test the perceived attitudes of the people to the existing system of environmental management. This was undertaken through a questionnaire administered to 45 randomly selected respondents from three villages located in three different AGA divisions.[19] The information is quite revealing as to the popular estimation of the existing management system.

It was found that 44 out of 45 respondents did not have any idea as to what the District Environmental Agency was. All 45 respondents (100 percent) professed ignorance of its powers and functions.

To the question whether quick remedial measures are effected to mitigate the adverse impact of any environmental hazards (landslides, drought, contagious diseases etc.), 38 respondents answered in the negative. Four responded positively while three stated that action is taken "to some extent".

The respondents who provided negative answers were requested to select from a set of precoded answers the reasons for the failure of officials to take prompt action. Table 4.1 indicates that most respondents are of the opinion that official apathy accounts for the failure to take prompt action.

The respondents were also referred to a list of environmental hazards and asked which particular hazards had most chance of being reported to officials (Table 4.2). It is significant that drought (24 percent) and landslides (22 percent) are the two environmental hazards most likely to be reported an indication that those which they think

16 The Buddhankotte Jatiya Godanegime Sangamaya in Kandeketiya AGA division provides an example of such a voluntary organization.

17 It is heartning that the Central Environmental Authourity has initiated action to set-up Environmental Protection Societies with representation in Gramodaya Mandalayas.

18 D. W. Brokensha et al (ed) *Indigenous Systems of Knowledge and Development,* (1980) University Press of America, USA.

19 See Chapter 1.

TABLE 4.1

REASONS FOR FAILURE TO TAKE PROMPT ACTION BY OFFICIALS

Reasons	*Number of Responses**	*%*
1. Lack of coordination among departments	11	16
2. Official apathy	36	54
3. Political interference	13	19
4. Preoccupation with other duties	1	2
5. Other**	6	9

Source: Field Survey
*Some repondents provided more than one answer
**The respondents explained that the officials had no concern for the poor.

have a direct impact on them are given priorty over those whose impact may be indirect and/or less significant. Thus pollution of water sources, outbreak of infectious diseases, soil erosion and forest fires receive relatively low rankings. Even illicit felling of forests though ranking third, indicates only a reporting rate of 14 percent.

TABLE 4.2

PROPENSITY TO REPORT TO OFFICIALS

Environmental Hazard*	Number of Responses	%
1. Illicit felling of forest	24	14
2. Drought	40	24
3. Landslides	37	22
4. Soil erosion	14	08
5. Pollution of water sources	10	06
6. Forest fires	08	05
7. Outbreak of infectious diseases	14	08
8. Illicit mining or quarrying	20	12
	167	100

Source: Field Survey
*The respondents were asked to imagine that all these activities took place in their localities.

However, an interesting point is that the people had no clear perception of either the village level or the divisional level officials to whom environmental issues may be addressed. The most frequently referred to village level official was the Grama Niladhari and the divisional level official the AGA. This indicates the absence of an interactive relationship between the communities and the majority of frontline officials concerned with environmental management (agriculture, health, forestry etc.).

The above finding also tallies with the answers to the question whether if required the services of village level and divisional level officials were easily available? In regard to village level officials 12 respondents (out of 45) answered in the affirmative while as much 33, provided negative responses. The negative responses were even higher (43) in respect of divisional level officials.

While there was general consensus on the need for environmental conservation, the respondents had no clear perception of the aims and objectives of the on-going environmental projects, and their likely benefit to the community. Another very important point which emerged from the survey is the concern of the respondents that conservation projects should be designed to protect "not only the environment but also the people who are its habitants." This statement which is a literal translation of a pronouncement of one of the respondents which received the consensus of others, is full of meaning. It underlines a disillusionment with the existing environmental

management system which is mostly regulatory. Moreover, it expresses a concern that conservation should not be 'anti-people'. In otherwords conservation and development are but two sides of the same coin.

Selected Projects

In this section attention is focussed on three environmental projects in the Badulla district to provide an insight into the nature of their implementation and the ensuing problems and issues.

Landslides Management

It was shown in chapter three that landslides are a major problem in the Badulla district. As a result there has been much concern to devise strategies to mitigate the effects of such hazards. A first step has been to undertake a preliminary study of the landslide prone areas by the National Building Research Organisation. Its findings are incorporated in a report providing information on landslide prone areas, the nature of landslides that have already taken place, the degree of damage caused and the potential risk associated with each location. The report also makes site-specific recommendations to counter the hazard.[20] These findings are, however, based on reconnaissance work and need to be substantiated by in-depth investigations of landslide prone areas. To implement and coordinate the management programme a District Committee on Landslides has also been formed. The management of landslides has necessitated the implementation of two main strategies. On the one hand steps have been taken to conserve the hazard prone areas and on the other evacuation of people from very high risk areas and their resettlement in safer locations. How effective have been these strategies?

As recommended by the NBRO, conserving landslide prone areas necessitates the implementation of the following steps either singly or in combination:

- preventing haphazard forest clearance
- closure of cracks
- grading of steep slopes
- provision of contour drains
- terracing
- improvement of slope drainage
- reafforestation
- prevention of the utilization of affected zones for agriculture.

Already, steps have been initiated by the district administration to implement these conservation measures. However, there are problems that have impeded their full implementation. Inter-agency coordination (district administration, JEDB, line departments and other concerned agencies) has been lacking. The community cannot be motivated to undertake conservation activities without appropriate incentives. Its mobilisation through grassroot organizations cannot be immediately forseen. The successful implementation of the conservation measures will also depend on the availability of funds through the decentralized budget and other means. Furthermore, the implementation of some of the above measures also calls for technical expertise which the district administration is constrained to find.

There are also problems relating to the human adjustment process. Although people have been warned against carrying out any form of activity in the affected locations, in the absence of alternative livelihoods, this warning has gone unheeded. At least in some instances officials have been wary in taking action against miscreants on sympathetic grounds. In areas where landslide occurrence has been on a small scale, the people are not fully aware of the potential havoc that a large scale landslide may cause. A group of people at Haldummulla attributed landslides to a *'diya-henaya'* (a massive bolt of lightening accompanied by heavy rain) than to any other cause.

The evacuation of affected groups has been successfully undertaken in several areas of the Badulla district. Thus in the Uva Paranagama AGA division evacuees have been resettled on land acquired from the Hungala and Talpitigala estates, and on State land at Wetalawa. Similarly, in Passara AGA division evacuees have been resettled on land obtained from Bukarinda estate. Nonetheless, there are problems affecting evacuee resettlement.

20 NBRO (1986) op. cit.

In the Ella AGA division a basic problem is the scarcity of suitable land for evacuee resettlement (i.e. land with non-steep gradients). Elsewhere problems have been caused by the absence of interagency coordination. Often there have been problems in getting land released from various agencies for the purpose, thus affecting the speed with which the evacuation process can be completed. The fact that boundaries of State land are not well defined, result in the delay in releasing even State land for evacuee resettlement. Quite often there is disinclination on the part of evacuees to leave their 'developed land', to be resettled in marginal land in which, resettlement usually takes place. It is important that adequate compensation be paid for the land which they are compelled to give-up; and as far as possible attempts should be made to provide them with 'good quality land.'

Another drawback in the evacuation programme is the fact that livelihood opportunities have not been given due consideration. For example, though evacuee resettlement has been completed in Uva Paranagama AGA division, there are no appreciable livelihood opportunities. It is expected that this situation will be ameliorated to some extent with the implementation of the community forestry project. Similar problems relating to the inadequancy of economic opportunities for the evacuees assail other areas as well.

It is also important that the systematic monitoring of landslide prone areas should be undertaken on a continuing basis. Furthermore, quick 'warning systems' and rapid evacuation procedures shoud be designed for those who continue to live in landslide prone areas.

Chena Stabilisation

The chena stabilisation project operates on a pilot basis in two grama niladhari divisions in the Badulla district viz., Balagolla (Migahakiula division) and Godunne (Kandeketiya division). In Balagolla, sixteen farmers have been initially included in the project, while in Godunne there are twenty-five. By its very nature, the project needs the involvement of a number of departments and agencies e.g. Land Commissioner's, Agriculture, Minor Export Crops, Agrarian Services and Animal Health.

Chena stabilisation is an attempt to 'fix' chena cultivation by utilizing the highlands for more stable forms of cropping. Such a change has been found necessary as chena cultivation is wasteful of forest resources under conditions of shortened fallows. The programme also has the indirect objective of providing land to the landless.

The project has several salient characteristics. It requires that the farmers plant at least one-acre in permanent crops e.g. coconut, in their allotments. What remains may be in mixed crops — usually semi-perennials are advocated. Appropriate tillage practices have to be utilized and soil conservation measures adopted. Livestock keeping is also encouraged with a view to develop a viable farm-economy. The project does not provide any direct support services but the beneficiaries are expected to make use of the existing governmental delivery mechanisms for their requirements of inputs and services.

It is evident that there are several problems which could in the long run affect project performance. The permanent cropping of highland signifies a complete departure from the traditional method of chena cultivation. In the traditional system soil fertility was maintained through land rotation. Moreover labour was the only input. The pattern of cropping allowed for both a seasonal and simultaneous rotation of crops, which in addition to establishing a favourable soil-crop relationship also contributed to disperse and minimize risks. In contrast, highland cropping on a sustained basis requires the application of inputs — fertilizer, weedicides and pesticides and tillage practices which are both time and labour consuming.[21] Another issue which acts as a disincentive is that permanent crops take a long time to provide returns. Furthermore, as is well evident in Kandaketiya drought which is of seasonal occurrence adversely affects the growth of permanent crops.

There are also other problems which influence the success of the pilot projects. The beneficiaries for the most part are illiterate and are not easily weaned away from their traditional practices. It also appears that there is no

21 It may also be noted that despite long years of experimentation it has not been possible to evolve a completely satisfactory method of highland cultivation capable of maintaining soil fertility under sustained cultivation. See for example, W. Gooneratne, *Kurundankulama Dry Farming Settlement*, (1977) ARTI. Some of the issues relating to highland cultivation are discussed in K. A. S. Wickrama, "Highland Cultivation Today and a Concerted Effort Towards Stabilisation" *Progress* (1984) 4, 23—39.

firm agreement on the unit of land to be alloted to a farm family. In Balagolla two acre plots were common but in Kandaketiya this seems to vary from two to five acres. There is also reason to believe that the farmers in any case tend to cultivate more than their legal entitlement – a clear indication that they seem to rely on extensive rather than intensive methods of cultivation. This may also be motivated by considerations of risk minimisation.

A pilot project of this nature requires a great deal of 'adaptive research' in which a two-way flow of information between the extension service and the farmer is maintained; further, the success of the project will also depend on its regular monitoring to identify bottlenecks. Balagolla and Godunne are remotely located and there are problems relating to both monitoring and the coordination of agency services. It appears that a greater planning effort (which involves better coordination and on-site adaptive research) needs to be put into the project, if the chena stabilisation project is to be widely replicated.

Community Forestry

Initiated in 1982 the Community Foresty Project is being managed by the Forest Department and is supported by funds from the ADB. The project in due course will extend to all AGA divisions. At present the community forestry project operates in a few AGA divisions of which the more notable are Haldummulla, Soranatota, Migahakivula, Hali Ela and Passara.

The community forestry project has several objectives. Primarily it aims at meeting the fuelwood and timber requirements of the rural people. But there are also other objectives such as supplementing their incomes, providing them with fruits and other forest products and restoring the ecological balance of degraded environments. Under the project the beneficiaries are provided with free seeds and/or seedlings and also extension services. One can hardly overstate the case for a project of this nature for environmental conservation. It is also now being realised that community forestry has a significant impact on the nutrition and general well being of the rural people. Studies in Kenya have shown that scarcity of fuelwood results in food items being selected not for their nutritional value, but for their low requirements of energy for preparation.[22] It has also been observed that,

> "Fetching of wood and preparation of food for the family is a responsibility of the women. And so as wood disappears women and children walk further and further from home to look for firewood which may only turn out to be twigs and sticks. Where these do not exist they will turn to agricultural residues and cowdung. These are products which should be returned to the soil in order to make it richer for food production."[23]

Similarly, it has also been identified that trees could play a significant role in countering seasonal poverty.[24]

The project has several key elements viz.,

- being people oriented
- involvement of both individuals and groups
- self-help (that is people have to participate and contribute according to their means.)

Project activities are pursued either on private land or leased out State land. In this discussion attention is focussed on community forestry activities undertaken on State land which is leased to individuals or groups on the basis of several criteria:

- the beneficiaries must reside in proximity to the lands being leased,
- they should have been resident in the project area for a minimum period of three years,
- the beneficiaries should have some means of income generation; it is therefore, implied that the idea is to provide a supplementary source of income,
- in any one family only one individual is entitled to receive State land.

Tree planting activities take two forms namely, the planting of fuelwood and timber blocks, and agroforestry which combines cultivation of trees with agricultural crops.

22 W. Maathai, "Kenya: The Green Belt Movement" *IFDA Dossier*, (1985) 49, 4—12.

23 Ibid.

24. Chambers & R. Longhurts, "Trees, seasons & the Poor "IDS Buletin (1986), 17, 44-47.

Despite the importance attached to the project there are several constraints. Here too, the problems of coordination are very evident. It has been found that for various reasons such as the difficulty of establishing the limits of State forests, obtaining land for the project has lagged behind in some areas (for example, in Haldummulla and Soranatota divisions). Similarly, the forest department has also not been able to meet the seed and/or seedling requirements of the beneficiary farmers. There is also another dimension to the problem. If the project is to be a success, the forest department should make an effort to provide the seeds and/or seedlings which the beneficiaries would like to plant in their woodlots. This applies especially to agroforestry. The survey revealed that the officials are not always responsive to beneficiary needs. There are also problems which relate to the technical support services. The officials of the forest department drew attention to the fact that the technical support for nursery management is rather inadequate especially in relation to the control of insects and pests which attack the young plants. Indeed, this appears to be one reason which has undermined the capacity to provide seeds and seedlings to meet the beneficiary requirements. The preoccupation of beneficiaries with their main livelihood activities was also cited as a constraining factor which affected the performance of the community foresty project. There is also some laxity in supervision and monitoring. Unless supervision and monitoring is well organized it will not be possible to meet the projected targets (in terms of plant density) set for individual and community woodlots. It is also found that the community involvement in the project also needs improvement. More public awareness should be created and the concept of 'taking forestry outside the forests' needs to be firmly established.

Therefore, it is evident that hitherto, the community forestry project has not been truly 'accepted' by the community. This is not surprising as a project of this nature has to evolve over a period of time. It appears that for greater impact the community forestry project need to incorporate several elements. Thus, it would be useful to involve the people in the production of seedlings. As it is there is too much of a paternalistic relationship between the frontline officials and the community. It would also enable to more effectively set in motion community participatory processes, while enhancing incomes of project participants.[25] A second element that could well be incorporated is to link tree production with strategies to counter seasonal poverty. This would necessitate adaptive research to be effective. In most rural societies including our own, trees have played and continue to play an important role in filling seasonal troughs. Thus,

> ".....trees do play a part in the strategies of the poor rural people, adding diversity and security to their repertories and resources for gaining livelihoods round the year. Further, analysis may well show that trees are often of special significance in easing or accentuating the seasonal burdens of women, especially with firewood or fodder collection. As they emerge from this evidence, trees seasonally stabilise, protect and support the livelihoods of the rural poor."[26]

There is also a need to establish a balance between rapid growing varieties of exotic trees and the slow growing but ecologically better suited indigenous varieties. Over dependence on exotic varieties interferes with the varied life forms of the existing ecological systems. A related issue is one already mentioned – the need to draw from the indigenous knowledge system which has many dimensions including climate, ecology and agriculture.

25 For example, the Green Belt Movement in Kenya follows such an approach as it is seen as an effective way of taking more trees to a greater number of people. In order to promote seedling production the Green Belt Movement has a scheme to purchase the seedlings produced by the community. See for example, W. Maathai (1985) op. cit.

26 R. Chambers (1986) op. cit.

CHAPTER 5

IMPLICATIONS FOR ENVIRONMENTAL PLANNING

Chapter two has highlighted the poorly developed nature of the Badulla district from a regional/spatial perspective. It has also drawn attention to the prevailing levels of poverty, in particular among the rural population and the resultant social implications — as illustrated by selected social indicators. The potential for the development of the district lies mostly in agriculture, as opportunities for large scale industrial development are limited. While land is available for development, there are limitations imposed by conditions of climate, terrain and soils.

Basic Issues

It is evident from chapter three that in the Badulla district problems of environmental protection and conservation are contributing to rapid environmental degradation. The findings also show that the environmental problems in their varied manifestations are also a reflection of the paucity of livelihood opportunities for the poor; eventhough some activities (for example, illicit gemming and felling of forests) are engineered by people who are by no means poor. It is clear that environmental management in the Badulla district needs to be supported by a well conceived plan for economic development — perhaps, more comprehensive and integrated than the existing Integrated Rural Development Programme. The potential for environmental conservation has not been fully integrated into IRDP although, there are important environmental components in it. As to the spatial dimensions of environmental problems, Fig. 7 is highly indicative of the existing situation. There is a clear clustering of environmental problems in the central parts of the district, while in the Northern and Southernmost parts — which are also less densely populated, the complexity of problems is correspondingly less. This spatial patterning will have to be taken into account in formulating an environmental action plan for the Badulla district.

Existing Constraints

The present study has been able to highlight some of the main deficiencies in the existing method of environmental management. A basic problem is that there is no conscious environmental planning as such. What passes for environmental management is merely the administration of regulatory functions by line departments concerned with the environment. The weaknesses inherent in the existing institutional machinery including that of the District Environmental Agency are also very much in evidence. Furthermore, the implementation capacity of environmental management is found to be wanting. A fact which clearly emerges from the findings is the very slow and protracted process involved in taking punitive action against environmental offenders. In some situations, as those pertaining to pesticides, the institutional back-up for law enforcement is totally non-existent. The urban environment too has its own quota of problems which is made still more conspicuous by the absence of any planned physical development of the three major towns in the district. However, the UDA has already initiated action to formulate integrated physical development plans for these urban areas. The study also reveals that the community participatory processes are extremely weak and have not been effectively moblized. Moreover, the perceived attitudes of the people clearly point to their disillusionment with the existing methods of environmental management. It is surprising that no determined effort is being made to 'learn from the people' and to relate their experiential knowledge to environmental planning. The three projects (landslide management, chena stabilisation and community foresty) which have been subjected to in-depth analysis illustrate very effectively, the limitations resulting from the existing methods of management, or the lack of it.

Guidelines for Action

What then are the feasible guidelines for an environmental action plan? These may be considered on a priority basis viz., the immediate, short-term and the long-term. It may be noted that the incorporation of these guidelines in a District Action Plan will have to be supported by facilitative action at the Centre to bring about desirable

changes in legislation and institutions. Further, the Central Environmental Authority too will have to act as a catalyst to create the conditions facilitative of environmental management at the district level.

Immediate Measures

Other than the proposed changes to the DEA, the immediate measures should concentrate on rationalising the process of environmental management at the district level by providing for adjustments in the existing system.

The District Environmental Agency should be made to play a central role in relation to environmental management. There is also very little public awareness of the DEA. As it is, the DEA has a very low-profile and is ineffective. The DEA should be made to perform not simply an advisory function but an overall coordinating function in regard to environmental management. To achieve this the DEA has to reach down to the divisional level by having its 'cell' in each of the AGA divisions. It is necessary that trained Environmental Officers be appointed in-charge of these 'cells' (located perhaps in the AGAs office) while the DEA itself should have the services of a Senior Environmental Manager responsible to the GA at the district level. The DEA should be provided with office space, finances and support facilities for its activities. As will be discussed later the ultimate objective of the DEA should be to perform the functions of an 'Environmental Intelligence Unit'.

It is necessary to set-up a sound environmental data base (both qualitative and quantitative) for the Badulla district. At present the availability of data are restricted and unsatisfactory. Even on a very basic matter such as landuse categories by extent, the available data are full of inconsistencies. But on more complex issues data are almost non-existent or even if they do exist, are hard to come by. The objective should be to generate a data base which is up-dated on a regular basis to support environmental planning. The DEA could be the repository of such a data base.

The case is also strong to immediately survey all State land in the district with a view to delimiting its boundaries. In many AGA divisions, for example, in Haldummulla, Kandeketiya and Soranatota doubts pertaining to boundaries of State land, have impeded the implementation of environmental projects such as community forestry, chena stabilisation and even evacuee resettlement. These uncertainties have also interfered with the detection and prevention of encroachments on State land.

It may be useful to explore the possibilities of incorporating environmental components in existing developmental projects. The project components of the Integrated Rural Development Programme may be re-examined with the above objective in mind.

The implementation of existing special environmental projects should be better implemented on the lines suggested in chapter four. A special effort should be taken to eliminate the weaknesses identified in them in regard to project implementation.

Immediate steps will have to be taken to strengthen the implementation capacity of the present management system by,

(a) raising the environmental consciousness of public officials at all levels in the district administration by exposing them to short-term in-service training programmes. The resources in the University system may be mobilised for this purpose with the CEA acting as a facilitator;
(b) sub-dividing the larger AGA divisions to enable closer supervision and monitoring of environmental protection and conservation activities by the AGAs. The GN divisions too should be correspondingly made smaller.
(c) effecting better inter-agency coordination. The District Development Council could perform this function with the DEA (in its proposed role) reporting to the DDC on a regular basis on environmental matters awaiting inter-agency action.

Another vital area that needs strenthening is that of community participation. From field experience it appears that there is little immediate prospect of setting-up viable organizations to promote community participation in environmental management. Hence, the immmediate concern should be to generate environmental awareness among the public by encouraging field / action programmes where the communities would participate on

a voluntary basis, for example, in tree planting, community waste and refuse collection, cleaning of water-bodies etc. The schools in the region should be made to take a lively interest in environmental activities through nature studies and field excursions[1]. In view of the rugged terrain, accessiblity is a problem and in the remote areas of the Badulla district, dissemination of environmental or other information is problematic. Attempts should be made to reach the remoter areas through mobile environmental units as successfully undertaken in Indonesia by the 'Green Indonesia Foundation.'

Early action should also be taken to formulate integrated urban development plans for the towns of Badulla, Bandarawela and Haputale.

Short-Term Measures:

Whereas, the immediatee measures focussed on the rationalisation process, the short-term measures should primarily be concerned with district level capacity building for environmental management. Hence, the DEA should be further strengthened to play the role of an Environmental Intelligence Unit; in so doing, it should also be able to fulfil the function of an environmental data bank.

As a further measure of capacity building it would be useful to encourage each line department or statutory authority at the district level to maintain its own environmental 'cell'. This would be one means of ensuring that environmental awareness spreads among bureaucracies within the government.[2] In such an event the DEA could, in fact, liaise with such 'cells' in carrying out the functions referred to above.

The legal process relating to environmental management should provide for swift action against environ mental offenders. The power to dispense with summary justice (by the imposition of fines, confiscation of tools and equipment etc.) could be delegated to the AGAs at the divisional level. A careful review of all environmental legislation should be undertaken to close all loop-holes and make them effective. Furthermore, environmental legislation should be simplified and codified for easy access to those concerned with environmental management.

In the short-term community participatory processes have to be strengthened. As pointed out in chapter four it would be more practical for participatory organizations to be concerned with the total environment, than with any particular aspect of it. In this sense the village level Environmental Committee proposed by the CEA is a step in the right direction, and should be actively promoted. In addition to environmental conservation a function of the environmental committees could be on the one hand to revive lapsed traditional attitudes to environmental management and on the other to bring to the fore the people based indigenous environmental knowledge systems.

It is also important that technical support services are made available to environmental managers. The problems encountered in the implementation of the control of Pesticides Act No. 33 of 1980, have already been cited. Therefore, there is a real need to set-up at least one fully equipped technical laboratory to report on technical aspects of environmental problems e.g. the degree of air or water pollution, extent of pesticide and weedicide residue in vegetables or other food items etc. It's task, therefore, would be to monitor environmental pollution in the district on a continuing basis to keep it within permissable limits.

Another short-term imperative is to promote research on district specific environmental issues, which should primarily be oriented to 'action' and 'adaptive' research. It was very evident in the course of the present survey that there is no technical information on for example, rates of soil erosion under variable conditions, the degree of water pollution in selected areas or sites, rates of forest growth and recuperation rates of wells in particular areas and their inter and intra-season variability. Even on the social environment there need to be more research for example, on people's perception of the environment — how do communites perceive the dangers accompanying a land slide?; or why do some people oppose community based forestry development?; also the adaptive research component in

1 The CEA in collaboration with the Department of Education has launched Environmental Pioneer Brigades in the Island's schools. This movement should be fostered and made to reach even the remoter schools.

2 Indeed, this is an objective that should well be realized at the national level as well. For example, the Tiwari Committee in its recommendations on improving Environmental Management in India suggested that each Ministry should set-up its own environmental cell. This has gone undeeded. What is proposed is an extension of the concept however idealistic it may seen. See A. Agrawal *et al, The State of India's Environment: A Citizens' Report* (1982) *Centre for Science and Environment.*

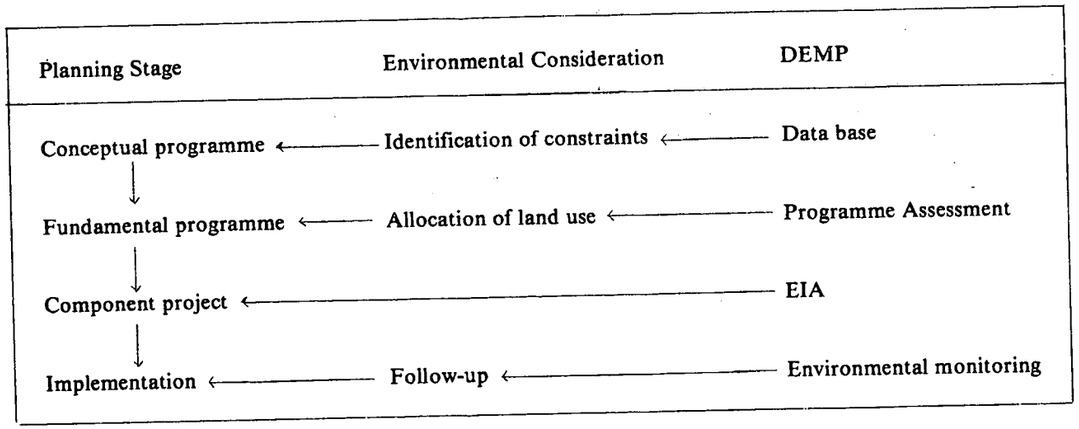
environmental research has also to be strengthened. The extent to which indigenous knowledge systems could be revived and/or adapted can be a focal area for adaptive research.

In the short-term special environmental projects should be formulated on the basis of information contained in chapter three. It may be noted that the chena stabilisation project is very much in its pilot stage while the community forestry project too has not yet been implemented on a district scale. There is a need to design special projects to deal with hitherto neglected aspects e.g. environmental sanitation and pesticide and weedicide contamination. The location of specific projects should take into account the spatial relationships depicted in Figure 7. Measures should also be taken to deal with environmental sanitation problems evident in the three main urban centres of the district.

Long-Term Measures

In the long-term there has to be a comprehensive approach to environmental planning in the Badulla district. The proposed immediate and short-term measures should underline the long-term environmental conservation strategy. However, this pre-supposes the availability of a District Environmental Management Programme (DEMP).[3] The object is to establish an interactive relationship between district development planning and environmental management.[4] It is an approach which facilitates the incorporation of Environmental Impact Assessment (EIA) into the management process. The interrelationships between district development planning and DEMP are shown in Fig. 8.

FIG. 8
INTERRELATIONSHIPS BETWEEN DEVELOPMENT PLANNING AND DEMP.



Adapted from Y. Shimazu (1987).

It may be pointed out that this approach is, in fact, useful to overcome some of the deficiencies identified in the EIA where for example, only the individual components are assessed and the composite impact may not be fully taken into account.[5] Furthermore, environmental monitoring provides an early warning system to effect adequate counter measures (follow-up) to neutralize any adverse impact resulting from development activity.

3 This has to be within the framework set by the proposed National Conservation Strategy.
4 What is proposed here is an approach similar to the Regional Environment Management Programme (REMP) in Japan, which was introduced in early 1980. REMP includes the establishment of an environmental data base; guidelines on the rational allocation of land use; regional pollution control and nature conservation plans; and the promotion of and support systems for environmental activities at the community level. See Y. Shimazu, *Regional Development Dialogue* (1987) 8, p 34—35.
5 Y. Shimazu (1987) Ibid.

SUMMARY GUIDELINES

Immediate Measures:

(a) The DEA to be strengthened to play a focal role in environmental management. It should extend to the divisional level by having 'cells' in each AGA division;
(b) Set-up the nucleus of an environmental data base;
(c) Survey State land within the district and delimit boundaries;
(d) Strengthen the implementation of existing special environmental projects;
(e) Explore the potential to incorporate environmental components in existing developmental projects e.g. IRDP;
(f) Strengthen the implementation capacity of the existing environmental management system by,
  — raising environmental consciousness of public officials through in-service training courses on environmental management,
  — rationalizing the size of AGA GN divisions,
  — effecting better interdepartmental coordination-the DDC and DEA to play a pivotal role here.
(g) Formulate integrated developmental plans for the three urban centres of Badulla, Bandarawela and Haputale.
(h) Promote community participatory processes primarily through environmental action programmes as a first step.

Short-Term Measures

(a) Elevating the status of the DEA to that of an 'Environmental Intelligence Unit' with a fully operational environmental data-bank;
(b) Line-departments and statutory bodies be encouraged to have their own environmental 'cells';
(c) Environmental legislation to be simplified and codified; legal procedure to be short-circuited by delegating authority to the divisional level to dispense summary justice againt environmental offenders;
(d) Setting-up village level environmental organizations to promote community participatory processes;
(e) Setting-up technical support services. At least one technical laboratory to be established in the district to monitor environmental pollution;
(f) Promote 'action' and 'adaptive' research on environmental issues;
(g) Special environmental projects to be launched, based on the findings reported in Chapter three. The location of projects to be determined on the basis of Fig. 7.

Long Term Measures

(a) A District Environmental Management Programme (DEMP) to be formulated;
(b) Interactive relationship to established between district development planning and the DEMP on the lines indicated in Fig. 8.

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